

ROADS and STREETS

HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

Gillette Publishing Co., 22 West Maple St.
Chicago 10, Illinois

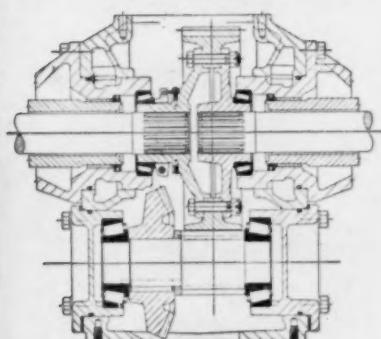
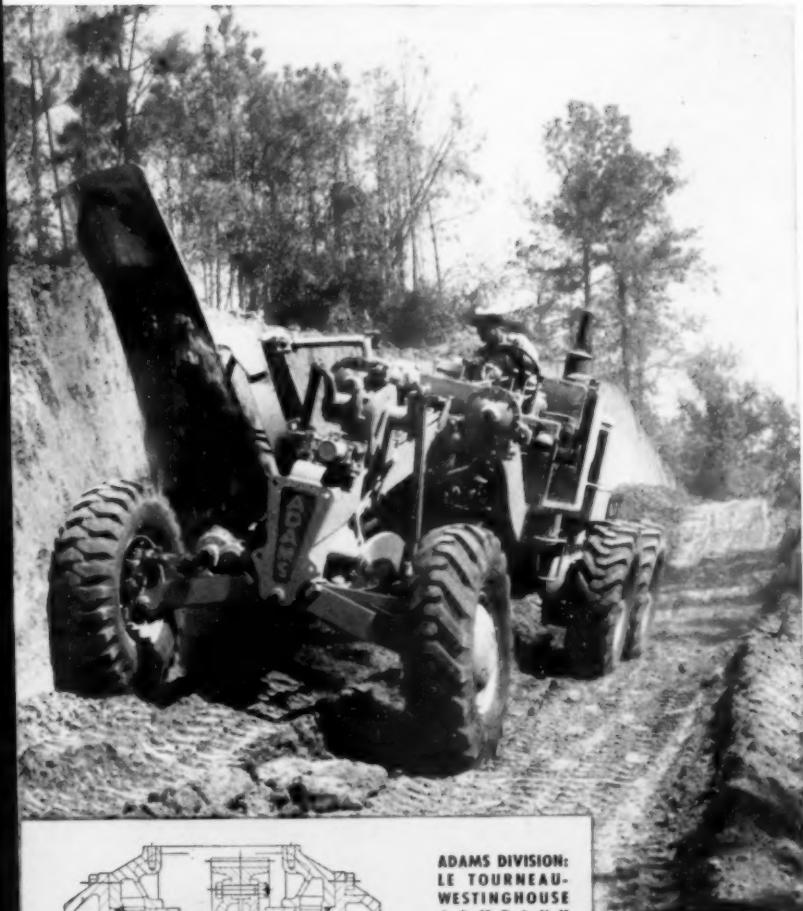
A GILLETTE PUBLICATION

NOVEMBER 1956

COMP-LRV-11-50
ANN ARBOR, MICH.
313 N. 1ST ST.
EUGENE B. POWELL
UNIVERSITY MICROFILMS
R6

Accepted as Controlled Circulation
Publication at Milwaukee, Wis.

**Makes the grade, takes the shocks
with TIMKEN® bearings**



**ADAMS DIVISION:
LE TOURNEAU-
WESTINGHOUSE
COMPANY**
mounts their
motor grader's
final drive on
Timken ta-
pered roller
bearings to
take radial,
thrust loads in
all combina-
tions, hold
shafts in rigid
alignment, re-
duce gearwear.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



*This symbol on a product means
its bearings are the best.*



260% Greater Torque...

**when your equipment is
powered with Chrysler
Industrial Engine and
Chrysler Torque Converter**

Here's a "natural" for any product requiring dependable power *plus* the means of automatically increasing work ability throughout the engine's speed range.

It's the Chrysler "power twins"—Chrysler Industrial Engine and Chrysler Industrial Torque Converter. Together, they make a lightweight, compact package offering high torque multiplication—up to 260% greater torque than you may be getting now—plus easy installation and trouble-free operation. Torque Converter features include dual cooling (liquid and direct air), and an optional built-into housing output shaft governor control.

Chrysler Industrial Torque Converter is assembled with the Chrysler Industrial Engine of the manufacturer's choice. The combination may be ordered Chrysler-equipped for use with direct drive, transmission or power takeoff. Manufacturers may also specify high or low inertia flywheel—whichever best meets their requirements.

Check this power combination—Chrysler Industrial Engine (230 to 331 cubic inch displacement, in-line 6 or V-8), plus Chrysler Industrial Torque Converter. For more details see a Chrysler Industrial Engine Dealer, or write: Dept. 10R, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.

Chrysler

INDUSTRIAL ENGINES



BUILT FOR EACH OTHER—CHRYSLER INDUSTRIAL ENGINE
AND CHRYSLER INDUSTRIAL TORQUE CONVERTER



INDUSTRIAL ENGINE DIVISION
CHRYSLER CORPORATION



Beth-Cu-Loy culvert rests easy under 64 ft of fill

Poking its nose out from under a 64-ft fill of earth and rock is a 340-ft-long culvert of Beth-Cu-Loy corrugated galvanized steel. This 66-in.-diameter culvert rests easy beneath its tremendous burden because Beth-Cu-Loy pipe is flexible, and thus tends to distribute the stresses peripherally.

Flexibility also permits corrugated galvanized steel pipe to take the impact and vibration of modern vehicular traffic. It takes care of changes in load caused by freezing and shifting soil, and makes grading and aligning easy.

With Beth-Cu-Loy galvanized steel drainage structures, there's less earth to remove, less to replace — the trench need be only as wide as the pipe. And installation is simple and speedy, without need for heavy equipment.

Beth-Cu-Loy culvert sheets conform to the rigid specifications of the American Association of State Highway Officials. They are rolled from open-hearth steel with copper added for corrosion-resistance. Additional protection comes from a tight, 2-oz coating of Prime Western Zinc by triple-spot test.

We shall be glad to furnish you with further details about Beth-Cu-Loy corrugated culvert sheets, as well as the names of fabricators who form them into pipe. Just call or drop a line to the Bethlehem district office nearest you.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem
Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation



BETHLEHEM STEEL

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ROADS AND STREETS, November, 1956

ROADS AND STREETS

Sixty-Four Years of Editorial Leadership

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Transfer of acceptance as Controlled Circulation Publication, from Cedar Rapids Iowa, to Milwaukee, Wisconsin, pending. Published monthly. Subscription \$5.00 per year.

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 63 years of continuous publishing in the highway field; combined with Engineering and Contracting and Good Roads Magazines, established in 1892.

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Construction Pesada (Latin)



CARVING OUT 800,000 YARDS OF ROCK—plus 5 million yards of earth—is taken in stride by Grandview Construction Corp. Their equipment “army” on the Massachusetts-Turnpike includes over 50 rear and bottom dumps, 17 bulldozers, 18 compactors, 15 compressors, over a dozen shovels, draglines and cranes—and all sorts of special equipment. The tires used in this rocky cut are Goodyear's super-tough Hard Rock Lug.

THOROUGH MAINTENANCE A SECRET OF SUCCESS—This earth-moving monster has been overturned to simplify underside repairs. Tires are All-Weather Earthmover. Like all Goodyear tires, these are readily recyclable—just contact your Goodyear dealer.

FAST-STEPPING OUTFITS END TUBE AND FLAP TROUBLES
with Goodyear 3-T Nylon Cord

TUBELESS TIRES!

Ever consider what tube and flap troubles can cost in down time—plus cost of replacing tubes, long before tires are worn out?

And Goodyear TUBELESS tires save in many other ways! They run cooler—
injuries are easy to detect—blowouts rarely occur—many repairs are simpler than ever before—construction and assembly are *airtight*—mounting of all sizes is quick and sure—and the simpler valve parts are re-usable!

Goodyear TUBELESS tires and rims are standard (or can be specified) on most sizes and types of new equipment—check your equipment manufacturer when purchasing. For moneysaving change-over of present equipment, simply contact a Goodyear dealer.

Goodyear, Truck Tire Dept., Akron 16, Ohio

Buy and Specify

GOOD YEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND
Road Lug, All-Weather, Sure-Grip—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

... for more details circle 215, page 16

NOW IN 3-T NYLON CORD
—TUBELESS OR
TUBE-TYPE!

HARD ROCK
LUG

ROAD LUG

ALL-WEATHER
EARTHMOVER

SURE-GRIP
LUG



Look for this nearby Goodyear dealer sign
for better tire values—better tire care.



Tecon's paving operation on the Kansas Turnpike . . . (right) because of an efficient batch plant and dependable Macks, like those shown, the minimum number of haulers were used.



Batch trucks speed Kansas Turnpike paving

... as much as 3,000 linear feet of 10-inch, 24-foot pavement in a 10-hour day . . . averaging 2,600 linear feet per day—that's quite a record for two twinbatch pavers working tandem with wire fabric laid on the 7-inch pour of the first paver. To a large extent this efficient paving was due to the trucks hauling the dry batches to the pavers—Mack trucks, each carrying four batches in their compartmented dump bodies.

Mr. S. N. Foster, project manager for The Tecon Paving Company of Dallas, Texas, is all for dependable Mack haulers—and for good reason! Tecon's 12 Mack B-42S dumpers can be depended upon for top performance 10 hours a day, week after week . . . assuring an uninterrupted flow of dry mix to the pavers.

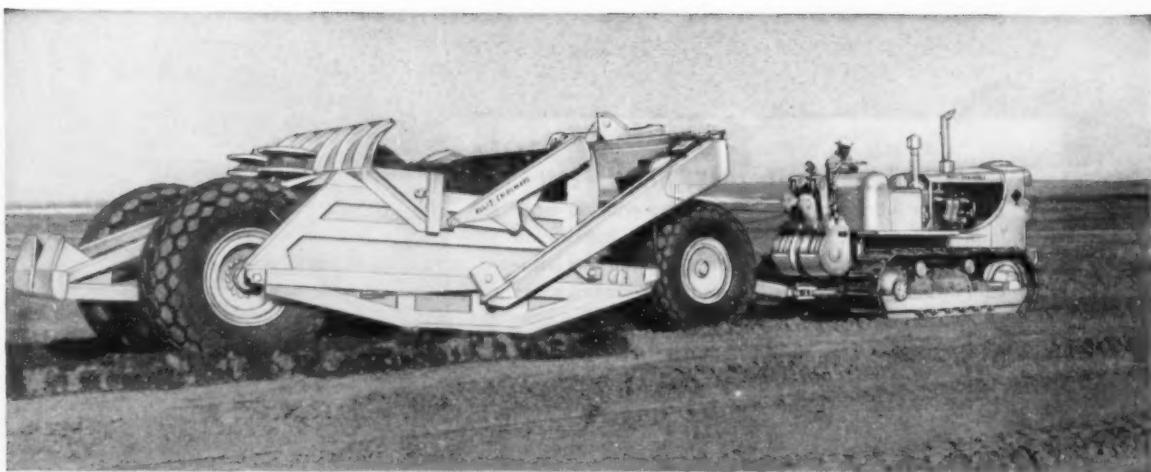
Why not discover for yourself, like Tecon, that when you use Macks, you can do more with fewer

trucks . . . more efficiently . . . and at less cost. Get the facts from your Mack Dealer or Representative. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

4429

MACK
first name for
TRUCKS

. . . for more details circle 231, page 16



Allis-Chalmers HD-16 crawler tractor and 315 pull scraper

Teamed to increase output ...keep jobs on the move

Here's more of everything you want in a tractor-scaper team . . . a combination of advanced basic design features that cut cost and time per yard.

The HD-16 has an all-steel box-A main frame that absorbs shocks and protects the power train. A powerful Allis-Chalmers diesel engine and your choice of either torque converter or standard transmission drive, give you plenty of work power for big jobs. And with 1,000-hour lubrication intervals for truck wheels, idlers and support rollers, even under severe conditions, you can eliminate daily greasing . . . convert maintenance time into production time.

With its wide, low bowl and offset cutting edge, the 315 scraper makes effective use of the HD-16's power to get heaping, void-free loads. Wheels are inside the cutting edge for smooth loading . . . and loaded weight is equally distributed on all four wheels for fast hauling, long tire life.

This earth-moving team can give you big output plus real dependability. Let your Allis-Chalmers construction machinery dealer show it to you now.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIV., MILWAUKEE 1, WIS.

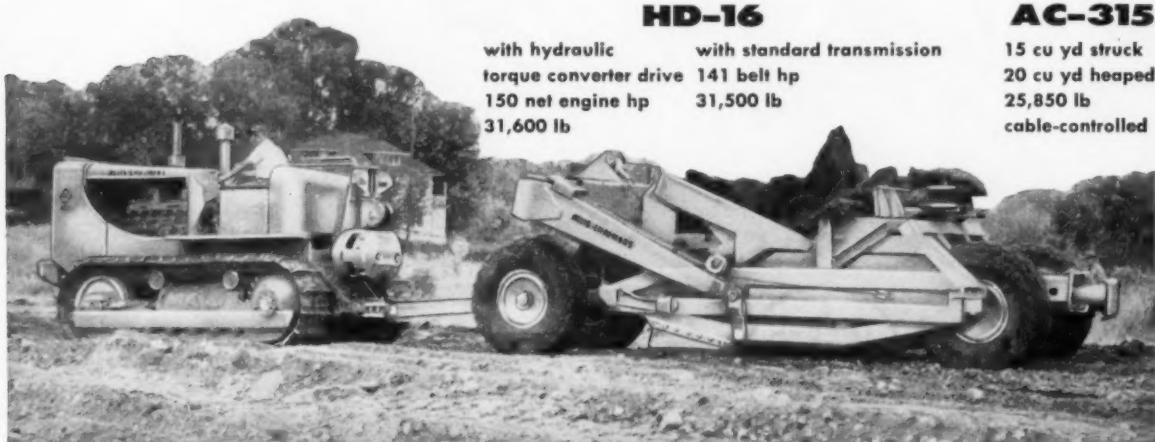
ALLIS-CHALMERS

HD-16

with hydraulic	with standard transmission
torque converter drive	141 belt hp
150 net engine hp	31,500 lb
31,600 lb	

AC-315

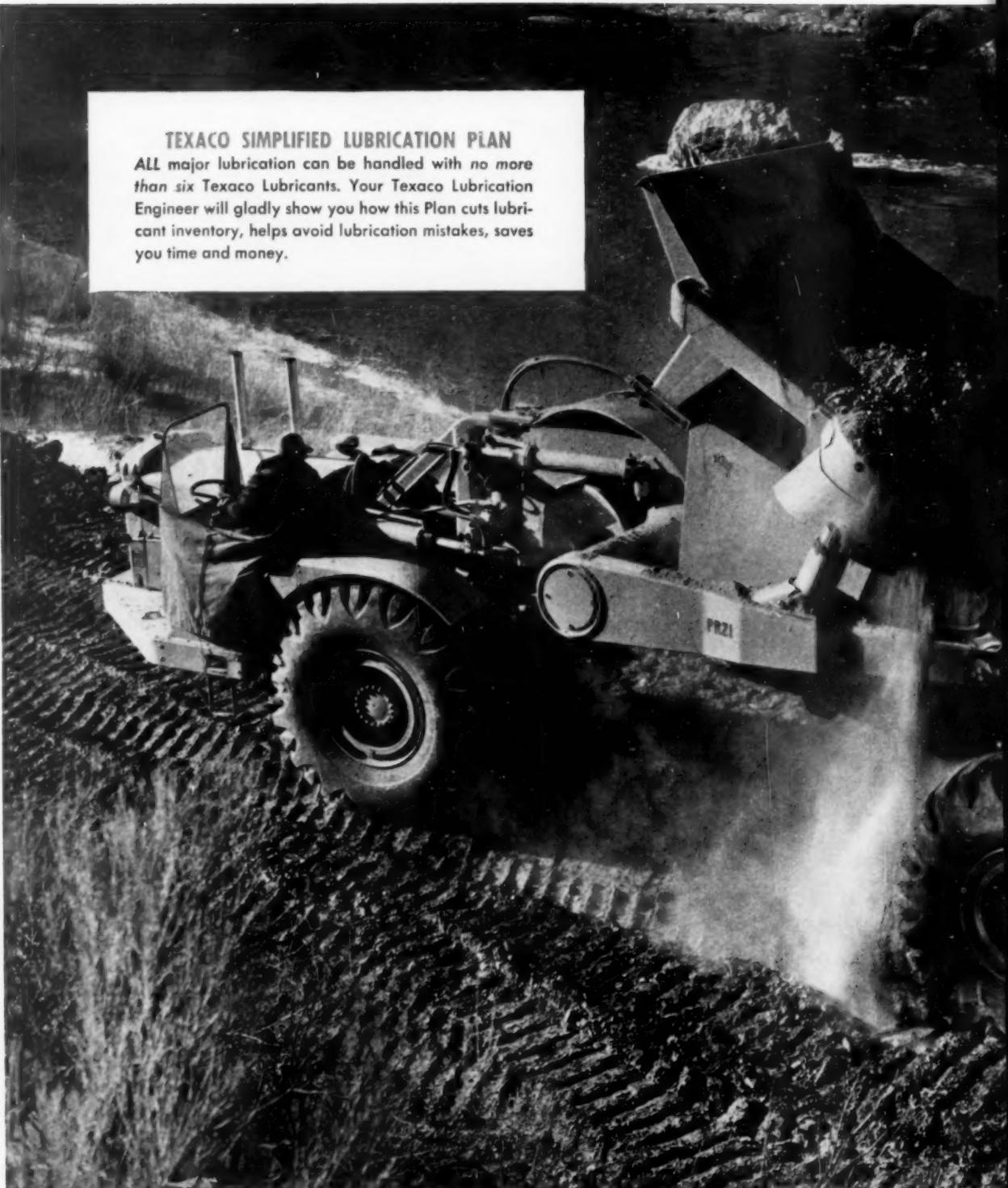
15 cu yd struck
20 cu yd heaped
25,850 lb
cable-controlled



... for more details circle 179, page 16

TEXACO SIMPLIFIED LUBRICATION PLAN

ALL major lubrication can be handled with no more than six Texaco Lubricants. Your Texaco Lubrication Engineer will gladly show you how this Plan cuts lubricant inventory, helps avoid lubrication mistakes, saves you time and money.



TEXACO



• • • • • • • • • • • • • • • •

Keep your engines **POWER- FULL**

• • • • • • • • • • • • • • • •

Full power performance from diesel and heavy duty gasoline engines depends on effective lubrication. And that, to contractors everywhere, means *Texaco Ursa Oils*. There is a complete line of these famous lubricants especially refined and processed to assure *more power with less fuel over longer periods* between overhauls.

Texaco Ursa Oils are detergent and dispersive. They assure clean operation. This means no harmful deposits — rings stay free, valves seat properly, you get full compression and complete combustion. Wear is reduced to a minimum. Both operating and maintenance costs are bound to come down.

For air compressors and hydraulic mechanisms, use *Texaco Regal Oil R&O*. It prevents rust and harmful deposits in compressor systems . . . prevents rust, sludge and foam in hydraulic systems.

For your drills, use *Texaco Rock Drill Lubricant EP*. You'll get longer drill life, and full protection against rust whether drills are running or idle.

Let a Texaco Lubrication Engineer help you simplify your lubrication and reduce your costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR ALL CONTRACTORS' EQUIPMENT

... for more details circle 257, page 16

ROADS AND STREETS, November, 1956

From New Orleans to Ketchikan "Small" CAT* Diesel Tractors Lick "Big" Jobs

Caterpillar D4 and D2 Tractors, for their size and weight, are as rugged machines as ever wore yellow paint. There are hundreds of jobs they can do just as efficiently as their bigger brothers. And contractors are proving it.

The four tractors shown here are working in localities as far apart as Alaska and Louisiana, and none of them is on an easy job. One owner, John Hannigan, of Philadelphia, puts it this way: "They're tough. I'd never buy anything else. They'll outwork other makes any time and any where. The only repairs I've made on this D4 in three years were adjustments to the main clutch, tracks and steering brakes."

Both the D2 and the D4 are built to handle the tough jobs, right up to their capacity, all day long and month after month. Yet they're small and compact enough to work in cramped quarters—tunnels or narrow city streets. Both are economical to operate, and

maintenance costs are consistently low, because they're *quality* built to stand up under punishment. Their dependable Caterpillar Engines have flywheel capacities of 48 HP for the D2 and 63 HP for the D4.

Let your Caterpillar Dealer show you how one of these smaller Cat Diesel Tractors will fit into your construction work and save you money. He backs their long work life with reliable service and Caterpillar parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

NAME THE DATE...
YOUR DEALER
WILL DEMONSTRATE

NEW ORLEANS

Taking the "blues" out of Basin Street, this Cat D2 Tractor, owned by Boh Brothers Construction Co., New Orleans, La., is helping widen the famous thoroughfare to 44 ft. on each side of a center parkway. Old St. Louis Cemetery shown in background.



TORONTO

Poce Construction Co., of Toronto, Ont., owns this D4 with No. 4A Bulldozer, shown 'dozing fill into a bend of the Humber River. This is a diversion job, digging a new channel to prevent flooding, and moving the earth into the old river bed.

**KETCHIKAN**

The D2 helped Manson-Osberg Co. in the construction of a 7 ft. x 8 ft. hydroelectric tunnel through granite rock near Ketchikan, Alaska. Equipped with scrubbers, the tractor worked the whole length of the 4000-ft. tunnel, moving out over 1000 cu. yd. of rock.

PHILADELPHIA

Here the D4, owned by Contractor John Hannigan, rips up old concrete foundations and rough grades for a new driveway and parking area at one of the Penn Fruit Co. supermarkets, in Philadelphia, Pa.



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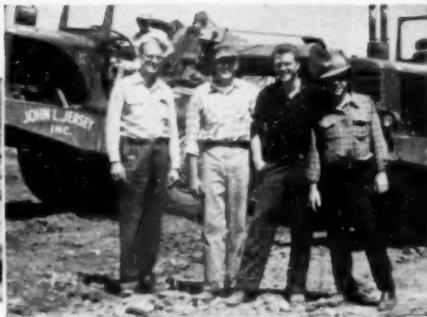


27-second loading. deliver EXTRA "PAY-DIRT"



Note how extra-high Payscraper apron-lift provides obstruction-free room for fast unloading. And straight-line, power-saving ejector reeving leaves more power on Payscraper wheels, to speed dumping and spreading.

Air-assisted clutch; big, safe, 4-wheel air brakes; exclusive Hydro-Stear — all contribute to give the Payscraper its outstanding operating ease and safety. The two Payscrapers and two other towed scrapers are push-loaded by the TD-24.



Left to right: John L. Jersey; J. M. Harris, Supt.; Dale Jersey, Supt.; and William Donaco, General Supt. of the job.





... plus super-fast get-away...

on industrial district job for John L. Jersey, Inc., Portland, Oregon

John L. Jersey, Inc., Portland, Oregon, uses International "55" Payscraper loading and transport speed—and famous TD-24 follow-through push-loading—to highball the 833,000-cu-yd Rockwood Industrial District contract to timely, profitable completion.

In only 27 stop-watch-certified seconds, and only 60 to 100 feet of travel, each "55" Payscraper's bowl boils heaping full of gravelly soil—and the "55" is off to the fill at up to 20 mph!

"More dirt on the fill"—more dough in the till

Owner John L. Jersey reports: "Last year we put over 2,000 hours on both our '55' Payscrapers with cable replacements as the only necessary repairs. This year we

got two more '55's and a new TD-24 to load them fast. I believe '55's are the most scraper for the money."

"We've found our '55's load in 25-30 seconds. They're simple and easy to maintain and operate. Quick, full-load Payscraper get-away means more dirt on the fill, and that's what we get paid for."

Largest of its kind in the Pacific Northwest, the triple-terraced, 188-acre Rockwood project, on the Columbia river, is a Union Pacific Railroad Co. development—to attract new industry to the Portland area.

Prove to yourself no other rubber-tired dirt-mover gives you the new Payscraper combination of capacity-adding performance features! See your International Construction Equipment Distributor for a demonstration!

See you at the ROAD SHOW—CHICAGO—Jan. 27 to Feb. 4, 1957



INTERNATIONAL® Construction Equipment

International Harvester Company, 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Beam Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Trucks . . . Diesel and Carbureted Engines . . . Motor Trucks

For more details circle 221, page 16



to help you beat the clock on the job!

TOUGHEST TIRES EVER BUILT

Today's fast schedules make breakdowns costly. That's why it pays to have the world's toughest tires on your rolling equipment.

Firestone has developed the strongest nylon tire ever made. The nylon cords are conditioned by Firestone's exclusive *Gum-Dipped Safety-Tensioned* process which controls tire stretch and tread-cracking. Firestone nylon plies resist impact breaks in the hardest going. They give you extra protection against flex breaks, heat failure and deterioration from moisture.

Firestone nylon tires beat breakdown losses on the job. And nylon-armored long life adds up to the lowest cost per-hour operation of any truck or construction tire. That's why it pays to use Firestone—and the cost records prove it!

SPECIFY GUM-DIPPED
SAFETY-TENSIONED
NYLON TIRES BY . . .

Firestone

Enjoy the Voice of Firestone on radio or television every Monday evening over ABC

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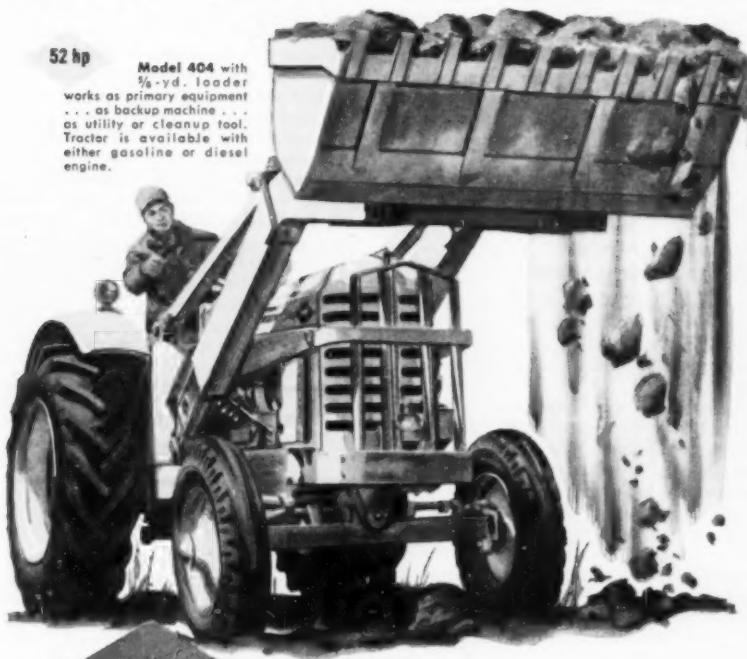
. . . for more details circle 205, page 16

ROADS AND STREETS, November, 1956

GREAT NEW IDEA in tractors and attachments

52 hp

Model 404 with
5/8-yd. loader
works as primary equipment
... as backup machine . . .
as utility or cleanup tool.
Tractor is available with
either gasoline or diesel
engine.



M-H-F

WORK BULLS

**Now from one source . . . a package of 5 versatile,
low-cost tractors with 20 power-matched attachments**

Work Bulls pay off as primary equipment . . . as backup machines . . . as utility or cleanup tools.

They help you rake in a bigger payoff on all projects . . . put money-draining manual-labor jobs on a profitable basis . . . knock the rough edges off tough jobs for medium-priced, single-purpose units . . . free mainline machines for high-profit, heavy equipment assignments exclusively.

Built to "construction standards," Work Bulls are always ready for rugged duty . . . require little maintenance. And remember, you deal with a *single* retail distributor for sales and service on both tractors and attachments. One source, one responsibility — a definite advantage for you.

Write today for your retail distributor's name and free, illustrated catalog.

M·H·F WORK BULLS

Division of Massey-Harris-Ferguson, Inc.

19-K Quality Avenue

... for more details circle 270, page 16

ROADS AND STREETS, November, 1956

Racine, Wisconsin

42 hp

Model 303 with angle-dozer and rear-mounted backhoe provides ideal means to clean up after main-line or intermediate machines . . . keeps equipment costs relative to job.



34 hp

Model 202 and backhoe — 5 sizes, 12" to 36" buckets. Swings 180°. Ideal for scattered "work and run" jobs — anywhere. Digs to depth of 13 ft.



42 hp

Davis Pit Bull features torque converter . . . "foot-shift" direction changes . . . five speeds forward, five reverse. Frequently out-works more expensive, single-purpose rigs.



Fork Lift

Model 202 lifts 4000 lbs. with 10 ft. mast, has extension with 21 ft. reach for lighter loads.

WHAT'S NEW in Equipment and Materials

Three-Boom Mine Drill Jumbo

A new completely air operated three-boom mining drill was introduced at the American Mining Congress, Oct. 4 in Los Angeles by Thor Power Tool Co., Aurora, Ill. It is stated that the Jumbo can operate at maximum efficiency in an area as large as 18 ft. wide and 10 ft. high. It weighs 7,800 lb. completely equipped with drifter rock drills and mountings. One man can operate the three booms without leaving his station at the air controls.

For more information circle 101 on Service Coupon this page and mail now.

Ammonium Nitrate Blasting Agent

A new type of stripping and quarrying explosive which is said to combine the power and efficiency of fixed high explosives with the economy of low-order blasting agents has been announced by Explosives Division, Atlas Powder Co., Wilmington 39, Del. Called Amocore, the new explosive consists of a basic cartridge charge of Amocol, Atlas' ammonium nitrate blasting agent, with a gelatin core.

The gelatin core, which runs throughout the length of the cartridge, appears to promote the development of full ingredient strength, providing a much more efficient explosive.

Like conventional ammonium nitrate blasting agents, Amocore must be de-

tonated with a high explosive primer. However, unlike conventional blasting agents, the continuous gelatin initiator is stated to insure complete detonation, and to eliminate the need for intermediate high explosive booster charges placed at regular intervals throughout the explosives column in order to maintain detonation.

For more information circle 102 on Service Coupon this page and mail now.

Paver Has Many Design Modifications

A new 34E dual drum paver, announced by Worthington Corporation, Harrison, N. J. incorporates 17 major design modifications and optional features.

The engine speed has been increased from 1400 rpm. to nearly 1800 rpm. The paver has hydraulically operated steering brakes in place of foot operated mechanical brakes.

Other features of the paver include a new four-strand chain drive to replace the old triple-strand drive, thus increasing the drive from the speed reduction unit to the countershaft, and a 700-gal. auxiliary water tank that has been redesigned to eliminate buckling due to water surge and the possibility of welds cracking.

The 3-in. pump has been moved from under the skip to a position under the engine.

Paver uses an improved drum roller

of cast 1040 steel with induction hardened surface. Skip floor liners will be installed on all units. New type inspection doors on countershaft guard. Automatic and semi-automatic welding will be used wherever applicable. The driving discs are now made in two pieces for easy removal and are reinforced to eliminate bending. Cartridge type Timken bearings are used in the bucket travel clutch. Boom bucket travel clutch shaft will be heat treated material. Traction drive shaft is changed to an alloy shaft, and the bushings are now bronze in place of babbitt. All excess sheet metal work has been removed.

For more information circle 103 on Service Coupon this page and mail now.

More equipment news page 105

Final Drive Seal for Tractors

A final drive bellows seal for Caterpillar tractors, called "Sure-Seal", now being marketed by Sure-Seal Equipment Co., 1820 NW, 25th Ave., Portland, Ore., has in addition to the regular rubber bellows a neoprene "O" ring seal inside two metal flanges. This extra seal prevents the lubricant in the final drive housing from reaching the rubber bellows, giving double protection against loss of lubrication and subsequent loss of time spent in replacing leaking seals. The "Sure-Seal" outer bellows keeps water and dirt out and the inner seal keeps the grease in.

Sure-Seals are available for the final drive of Caterpillar tractors D-4, D-6, D-7 and D-8. Also there is an outer sprocket diaphragm seal for TD-24 tractors.

For more information circle 104 on Service Coupon this page and mail now.

90-Ton Low-Bed Trailer

A new 90-ton capacity Model TDW-90-FG low-bed trailer, announced by Talbert Trailer, Inc., 7950 West 47th St., Lyons, Ill., is stated to provide quick, easy, safe over-the-front-end or over-the-rear-end loading by means of Talbert's patented removable gooseneck and removable rear axle assembly. Construction of the rear axle assembly features full width solid bar axles and Hendrickson T-900 tandem unit (90,000 lb. rated capacity). Standard specifications call for a deck length of 24 ft. but additional deck length is available on special order. Standard platform or beam type deck construction is also available. Overall length is 45 ft. 9 in. and overall width is 10 ft. 3 in. Tire size is 14.00 x 24-24 ply.

For more information circle 105 on Service Coupon this page and mail now.

MAIL THIS COUPON TODAY!

ROADS & STREETS
22 West Maple Street
Chicago 10, Illinois

CIRCLE THE NUMBERS AND MAIL NOW!

Please send me further information on products and materials mentioned in the November Roads & Streets as circled below

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Name _____ Title _____

Firm or Gov't. Dept. _____

Street _____

City _____

State _____

11-56

NOT GOOD AFTER DECEMBER 15, 1956

A READER SERVICE FOR YOUR NEEDS

ROCK AND DIRT MOVE AS GREENVILLE ATECO RIPPER GOES TO WORK ON BLUE RIDGE PARKWAY



BIG BITE TAKES FULL POWER OF TD-24 TRACTOR

The big Greenville tractor-mounted ripper proved itself on a rough testing ground originally marked for blasting, and shovel and truck loading. Biting to depths of 24 inches, the powerful unit tore out layers of rock and dirt without explosives. Swivel shanks give the points live action that shatters rock and dirt loose for scraper loading.

Roy Cantrew, veteran construction man who operated the unit, used it to rip, bulldoze and push-

load. He found it possible to raise or lower the ripper points as little as an inch at a time . . . a control factor that marks the precision construction put into the new tool.

PUSH-LOADING SCRAPER

The new Greenville ripper does not interfere with push-loading operations or steering of the tractor. On this job all loading was planned to be a truck-shovel operation. The powerful bite of the ripper made



push-loading possible—a big saving in man-hours and equipment operation.

AND BULLDOZE, TOO

Addition of the ripper does not hamper bulldozing operations. Blade and ripper are in place at all times. Many operators rip one way, turn around, then bulldoze their way back. One man with one machine can handle jobs previously done by three or more pieces of equipment.



FOR MORE INFORMATION

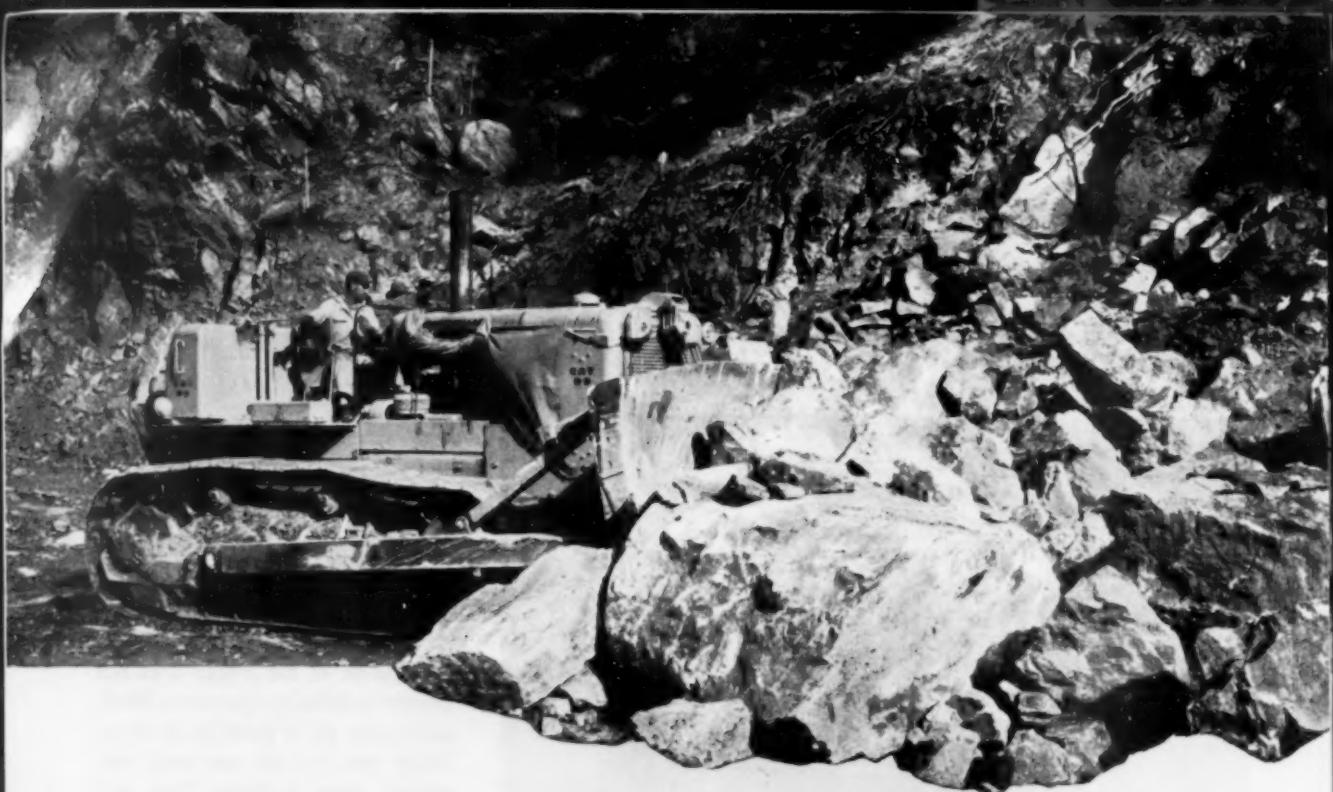
You'll want to know more. Your nearby International dealer can give you the facts. He's listed in the Yellow Pages of your phone book. If you can't find him, write to us.



GREENVILLE
STEEL CAR COMPANY
ATECO DIVISION
Greenville, Pennsylvania

. . . for more details circle 271, page 16

ROADS AND STREETS, November, 1956



LOOK AT THE BOULDERS THIS D9 IS 'DOZING!'

When there's a tough job to do, Schmidt Construction Co.,
Grand Junction, Colorado, hands it to this power-packed giant

Power is what the Schmidt Construction Co. wanted when it purchased this CAT* D9 Tractor with No. 9S Load-Shape Bulldozer. And *power* is what the company is getting. Here, on a construction job involving about 75,000 cu. yd. of rock work on Bear Creek Canyon Road near Denver, the D9's punch really paid off. Granite boulders, shot from the mountainside, proved too big for a shovel or other machines to tackle. Working 8 hours a day, 6 days a week, the D9 handled them with on-schedule performance.

Built for big production in tough going, the Turbocharged D9 delivers 320 HP at the flywheel. To meet your needs, it is available with torque converter or direct drive. In spite of its weight—more than 29 tons—it works with the agility of smaller tractors. Hydraulic boosters provide power for steering, braking and master clutch use. Many other features also contribute to the D9's efficient, economical performance, among them:

- For more working power, its Turbocharger, driven by engine exhaust, packs air into the engine according to engine load, not engine speed.

- Its constant power drive for rear-mounted cable control makes the operation completely independent of flywheel clutch or torque converter, boosting efficiency.
- Its in-seat gasoline starting system with single-lever control provides quick, sure starts.
- It's easy to service major drive components—oil clutch, torque converter, transmission and steering clutches each can be removed individually.

Your Caterpillar Dealer, who backs all Caterpillar equipment with prompt service, will be glad to show you how the D9 can step up production and profits for you. Ask for a demonstration!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

STEP UP
PRODUCTION AND
PROFITS WITH THE D9

ROADS AND STREETS

Sixty-Four Years of Editorial Leadership



Washington News Letter

By Duane L. Cronk

November 10, 1956

Principal highway news last month - and it was a real headline maker - was the President's appointment of Bertram D. Tallamy as the nation's first Federal Highway Administrator. Mr. Tallamy will be responsible for policy and administration of the \$33-billion National Highway Program. He will be the key liaison figure between the Administration and the Congress and between the federal Bureau of Public Roads and the state highway departments, when he takes over on January 1.

(In the meantime, another top-notch highway man, John A. Volpe, commissioner of public works for the state of Massachusetts, will serve as interim administrator. C. D. Curtiss will continue to work as commissioner of the Bureau of Public Roads under the new administrator.)

Tallamy's appointment to the top-policy highway job drew applause from highway officials and industry leaders around the nation. He is one of the most popular men in the field, who has revealed outstanding personal characteristics of leadership and the ability to see the larger picture of how highways support the general health of the economy and stimulate expansion.

* * *

As Federal Highway Administrator, Mr. Tallamy will direct completion of the 41,000-mile National System of Interstate and Defense Highways and renovation of the entire 700,000-mile federal-aid network. He is ideally suited for the big task, officials here are saying, having distinguished himself in two demanding assignments - as superintendent of public works for the state of New York and as chairman of the New York Thruway Authority during its construction period. His experience in building the billion-dollar, 562-mile thruway is good background for his new job.

* * *

How contractors feel about the business outlook of the near future was revealed recently in a survey by the Associated General Contractors of America. Some of the results:

- 87.1% anticipate that materials cost will rise and remain in short supply for awhile.
- 49.6% expect bid prices to increase.

(Continued on next page)

(Contractors reported shortages of structural steel in 41 states, steel pipe in 20 states, reinforcing steel in 19 states, wire mesh in 16 states and cement in 11 states.)

To ease the steel shortage, the Bureau of Public Roads is urging the state highway departments to step up advance planning of structures and get their steel orders in earlier.

"Many of the reported 'shortages' of structural shapes could be avoided," one BPR official pointed out, "if engineers would modify their time schedules."

It's a problem, not so much of capacity, as of procedure. First of all, the steel mills will not roll shapes until they get specific orders. (They don't have storage space to work otherwise.) Second, the mills are not set up to turn out all sizes at the same time. Consequently, they will run 18" beams for a few weeks, then 24" beams, etc. If a contractor misses the cut-off date for a certain size, he has to wait for the next "go-round."

That's why the bureau is advocating that a state design its bridges earlier and put in its order at once. In that way, the order will get into the mill's schedule and the steel will be available when its time to let a contract for superstructure erection.

* * *

There is fierce competition among highway officials for the 1,000 miles Congress authorized be added to the National System of Interstate and Defense Highways. A Bureau of Public Roads official reports that requests already total 13,000 miles, and some tough decisions will have to be made before long.

Highway planners are afraid this is only the beginning of what will be a continuing siege to enlarge the 41,000-mile system. Colorado politicians - justifiably perhaps - who wanted a Denver-Salt Lake City route on the system, were mainly responsible for obtaining authorization for the 1,000-mile enlargement of the network. But it's hard to know where to draw the line.

It is generally agreed, however, that many more additions will dangerously dilute the available funds, threaten completion of the System and even lead to lower standards of construction to "make the money go farther."

* * *

On the contractor labor front: Secretary of Labor Mitchell announced he would enforce rigidly the new wage and hour provision applying to the National Road Program. In pledging full federal support, Mr. Mitchell told the Union of Bridge, Structural, and Ornamental Iron Workers that the Labor Department under the Eisenhower administration has tripled its enforcement activities. "We will continue to do this on the new road program," he declared. "We do not propose to tolerate any chiseling anywhere on the part of any employer."

The Federal Highway Program, Mr. Mitchell said, will give building construction workers "an unprecedented opportunity to bring the benefits of organization to other sections of the country which do not now have them." Mr. Mitchell drew applause also when he said he hoped that "before the next Congress adjourns we will have accomplished a revision of the Taft-Hartley Act so that construction workers will be fairly treated under it."

DEPENDABILITY

HUBER-WARCO 7-D Motor Grader



torque converter • power-shift transmission

Tough grading assignments are met quickly and efficiently with the 140 h.p. Huber-Warco 7-D motor grader. The perfect balance of weight and power, plus torque converter and power-shift transmission, handles a larger volume of work with fewer passes.

A tail-shaft governor automatically adjusts engine RPM to meet load conditions, at any ground speed set by the operator. Other performance features include: completely hydraulic cab-controlled blade

movement; power sliding moldboard; elimination of a foot clutch and many more.

Other Huber-Warco torque converter graders are: 6-D (100 h.p.), 6-D2 (125 h.p.), 7-D2 (150 h.p.) and 5D-190 (195 h.p.). Models with standard transmission include: 4D-75 (75 h.p.), 4D-85 (85 or 93 h.p.) and 4D-115 (115 or 123 h.p.). This complete grader line offers a size for every job.

For a demonstration—see your nearest Huber-Warco distributor



Road Machinery

HUBER-WARCO COMPANY
MARION, OHIO, U. S. A.

CABLE ADDRESS: HUBARCO

ROAD ROLLERS • MOTOR GRADERS • MAINTAINERS • GRINDERS

... for more details circle 219, page 16

ROADS AND STREETS, November, 1956

for tough earth-moving jobs . . .



CUTTING EDGES

When you've got an earth-moving job that's mighty tough... when you *have* to have cutting edges that can take rough going—that's the time CF&I Cutting Edges really pay off!

For every CF&I Cutting Edge—whether it's for a scraper, grader, dozer or allied equipment—is carefully made from special analysis steel that's selected for its resistance to abrasion and fatigue, then scientifically hot rolled, punched and inspected to make sure it's perfect.

Next time you need cutting edges, make sure you investigate CF&I Cutting Edges. You'll find that they are available in a wide variety of lengths, widths, thicknesses and hole spacings; flat or curved, with beveled or square ends, and in different finishes. All are the products of CF&I's quality control that's complete from ore through finished product.

CF&I CUTTING EDGES
THE COLORADO FUEL AND IRON CORPORATION

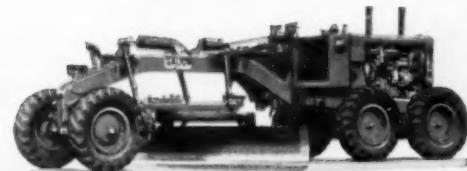
Albuquerque · Amarillo · Atlanta · Billings · Boise · Boston · Buffalo · Butte · Casper · Chicago · Denver
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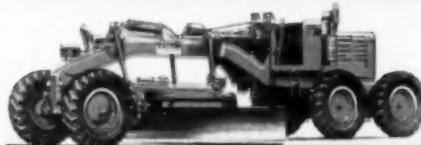
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ROADS AND STREETS, November, 1956



3 GRADERS With GRADE-O-MATIC Torque Converter Drive
Model T-700, 190 h.p. Model T-600, 140 h.p. Model T-500, 125 h.p.
40,125 lbs. 30,785 lbs. 25,000 lbs.

MODEL 118 GRADER
115 OR 125 h.p., 24,910 lbs.



MODEL 104 GRADER, 100 h.p., 23,635 lbs.
MODEL 450 GRADER, 75 h.p., 22,415 lbs.

MODEL 303 GRADER
55 h.p., 14,445 lbs.

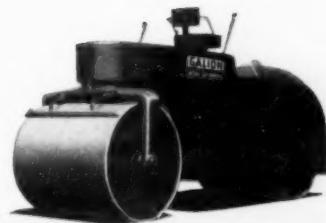
MODEL 503 GRADER
50 h.p., 9,360 lbs.



The most complete line of GRADERS and ROLLERS available



THREE-AXLE TANDEM ROLLERS
With ROLL-O-MATIC Torque Converter Drive. Variable Weight, 14-20 Ton.

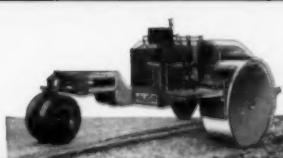


TWO-AXLE TANDEM ROLLERS
With ROLL-O-MATIC or Gear Shift Drive. Variable Wt., 5-8, 8-10½, 8-12, or 10-14 Ton.



THREE-WHEEL ROLLERS
Spoke-Type or Variable Weight Rolls
"Warrior", 2 Sizes - 7 to 10 Ton
"Chief" ROLL-O-MATIC, 4 Sizes - 10 to 16 Ton

PORTABLE ROLLER
Variable Weight
7100-9765 lbs.



SMALL TANDEM ROLLERS
3-5 Ton Variable Weight
4-6 Ton with Retractable Wheels

TRENCH ROLLER
Variable Weight
8785-10220 lbs.

THE GALION IRON WORKS & MFG. CO.
General and Export Offices, Galion, Ohio, U.S.A.
Cable Address: GALIONIRON, Galion, Ohio

... for more details circle 210, page 16

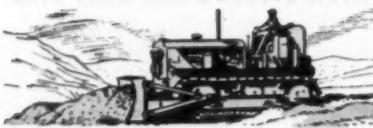
ROADS AND STREETS, November, 1956

**YOU CAN
DEPEND
ON A...**
GALION
FOR TOP
PERFORMANCE

MAKE YOUR TRACTOR WORK WHILE BACKING UP!



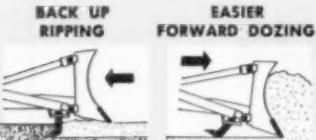
PRECO Back-Rippers



These powerful Rippers work while the tractor is backing up. They convert the bulldozer's deadhead time to work time — conditioning the ground for easier, faster dozing on the next forward pass.

Thousands of Preco Back-Rippers are in use around the world. They save time and have replaced other equipment in building pioneer roads, clearing land and rights-of-way, in gravel pit operations slate breaking in coal strip mines, mounted on pusher tractors for faster scraper loading, for logging operations and many other uses. Quickly installed on most straight and angling blade bulldozers.

See your Caterpillar Dealer or send the coupon for information.



Preco Back-Rippers are completely automatic in operation — they dig in on the back-up trip and ride on the surface when going forward. There are no controls and, when desired, they can be locked up out of the way.

PRECO INCORPORATED

6300 E. Slauson Avenue
Los Angeles 22, Calif.
Please send information on Preco Back-Rippers.

Name _____

Address _____

_____ for more details circle 238, page 16

Headlines

Open world's longest overwater highway bridge

The \$30,700,000 Greater New Orleans Causeway has been opened to traffic four months ahead of schedule. Reaching north from New Orleans across Lake Pontchartrain for 24 miles, it is the world's longest highway bridge.

The contractor, The Louisiana Bridge Company (a joint venture of Brown & Root, Houston, Texas, and T. L. James & Co., Ruston, Louisiana), was able to complete the huge undertaking in just 19 months as a result of simplified design and unique assembly line construction methods. The bridge is constructed of precast,

prestressed parts which were prefabricated in a complete manufacturing yard in January, 1955. Three months later, the first pile section was spun and five months after the start of the yard, the first deck slab was installed. The Raymond Concrete Pile Co., New York, licensed Louisiana Bridge to manufacture and install Raymond's prestressed concrete cylinder piles.

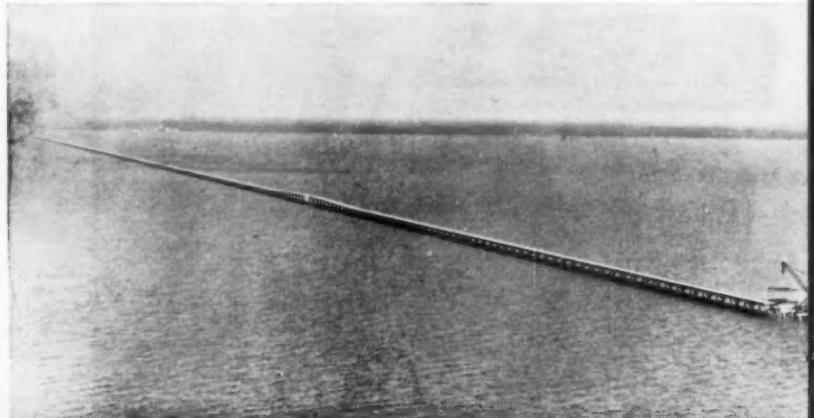
The bridge has a two-lane roadway 28 ft. between curbs. Two double-leaf bascules provide for passage of large craft while three "humps" will permit passage of smaller boats. In all, 4,886 54-in. Raymond cylinder piles, averaging 88 ft. in length, were used to support the structure. 2,232 185-ton prestressed concrete deck slabs, 33 ft. wide by 56 ft. long, were installed on the piles. In addition, 3,000 tons of structural steel, 18,000 tons of reinforcing steel, 3,500 tons of stressing cable and 3,200 tons of stressing wire were used in the bridge.

The contractors used a 200-ton derrick barge, four 50-ton derrick barges, 36 barges, 7 tugs, 7 speed boats and launches and 15 trucks. The project was designed and construction supervised by Palmer & Baker, Inc., consulting engineers of Mobile, Ala. Project manager was J. E. Walters; chief engineer, David Milham; general superintendents, James Quillan and Walton Gasaway.



● A conspicuous demonstration of the time and money saving advantages of building long, standardized trestles with precast, prestressed concrete.

● The 24 mile long Greater New Orleans Expressway Bridge across Lake Pontchartrain.



B.F. Goodrich



How all-nylon Super Traction tires pull contractor through the big, tough jobs

SUGDEN & SIVIER, INC., operate 150 vehicles, including dump and transit mix trucks, semi-trailers, scrapers and graders, out of Oak Park, Michigan. The unit above is at work on a slag grading job at the Detroit Sewage Treatment Plant where both traction and flotation are all-important.

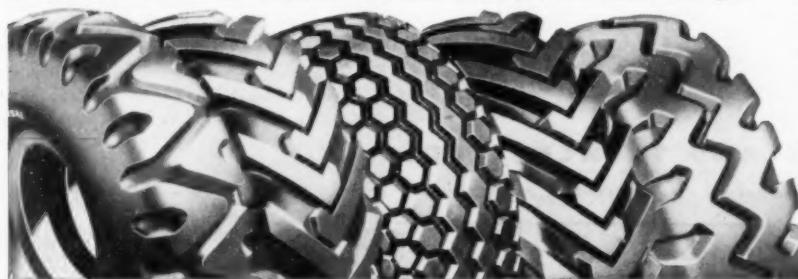
That's why this contractor chooses

B. F. Goodrich *all-nylon* Super Traction tires. They pull through the big, tough assignments and do an "all-around job", the company reports. Thick Super Traction cleats take a deep bite, give positive traction. The wide tread makes a big footprint to give greater flotation in soft going. And under the tread is the B. F. Goodrich *all-nylon* cord body.

Nylon withstands double the impact of ordinary cord materials, resists heat blowouts and flex breaks. That's why the B. F. Goodrich *all-nylon* cord body outwears even the extra-thick Super Traction tread, can still be recapped over and over!

Your B. F. Goodrich retailer has the big, tough tires for your off-the-road work. Let him show you the ones that will save you money. Or write *B. F. Goodrich Tire Co., A Division of The B. F. Goodrich Co., Akron 18, Ohio.*

Specify B. F. Goodrich tires when ordering new equipment



... for more details circle 214, page 16

ROADS AND STREETS, November, 1956

B.F.Goodrich
FIRST IN RUBBER

Your B. F. Goodrich retailer is listed under Tires in the Yellow Pages of your phone book



In Pasco, Washington, too— Clevelands do the digging



DISTRIBUTION SYSTEMS in Pasco and Kennewick, Washington, are being constructed for Cascade Natural Gas Company by A. J. Curtis Construction Company of Casper, Wyoming. Even in alleys and similar narrow rights of way, such as the 4-inch main installation shown, Curtis, cashing in on the compactness and maneuverability of his Cleveland trenchers, is averaging 1,650 feet of trench per 6-hour day.

Crowded cramped quarters or open fields, rocky soils or easy digging—Cleveland's original compactness, maneuverability, exclusive wide range of power and speed combinations and recognized quality construction are the reasons they dig *more trench . . . in more places . . . at less cost*. That's why you'll find Clevelands leading the way on gas work in the Pacific Northwest—as they have *everywhere* for over 30 years.

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO



... for more details circle 200, page 16

Personal

GEORGE H. HICKOX, formerly with the National Science Foundation has been named director of research at the Army Corps of Engineers Research and Development Laboratories at Fort Belvoir, Virginia.

E. V. MILLER, who resigned recently as state highway engineer of Idaho, has returned to his home state of Arizona, where he will be in the firm of Johannessen & Girand, consulting engineers of Phoenix and Tucson. Miller was formerly state highway engineer of Arizona and is a past president of the Western Association of State Highway Engineers.

R. A. FARLEY, recently assistant chief engineer, has been appointed acting chief engineer of the Pennsylvania Department of Highways. He succeeds Arthur L. Weisenberger, who resigned after a brief tenure to return to his private engineering practice.

MASON G. LOCKWOOD, consulting engineer of Houston, Texas, has been elected president of the American Society of Civil Engineers. He succeeds Enoch R. Needles, consulting engineer of New York City.

New vice-presidents of the ASCE include Francis S. Friel, Philadelphia; and Norman R. Moore, Vicksburg, Miss.

New ASCE directors include Randle B. Alexander, bridge engineer of the Texas highway department at Austin; E. L. Durkee, engineer of erection, Fabricated Steel Construction Division of Bethlehem Steel Co.; Clinton D. Hanover, Jr., consulting engineer of New York City; William J. Hedley, Wabash R.R. Co., St. Louis; Finley B. Laverty, Pasadena, Calif.; Howard F. Peckworth, managing director, Concrete Pipe Association, Chicago.

MAJ. GEN. EMERSON C. ITSCHNER has been appointed Chief of Engineers, U. S. Army, succeeding Lt. Gen. Samuel D. Sturgis, Jr., who has applied for retirement. The appointment is subject to Senate confirmation when Congress convenes early in 1957.

Gen. Itschner, age 53, is one of the youngest officers to be given this appointment. The Corps of Engineers which he will head today constitutes both a Combatant Army and a Technical Branch with a present peacetime strength of 10,000 officers, 100,000 enlisted men and 50,000 civilians.

BUYER



CF&I



**Your Wickwire Rope
Distributor and our
metallurgist . . .
work together for you**

This metallurgist—who is responsible for the quality of our rope wire—is with your Wickwire Distributor every time he makes a call.

True, he's physically in his laboratory, supervising the thorough testing of *both ends of every coil* of wire to assure uniformity throughout the coil. But, whenever your Wickwire Distributor calls, he has the full assurance that metallurgists like this are constantly making sure that the product has the right chemical and physical properties to give long, dependable service.

It's just one more reason why your Wickwire Distributor knows he's got top-quality wire rope, slings and strand to sell . . . and that these products will serve you well.

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

... for more details circle 202, page 16

ROADS AND STREETS, November, 1956

In place of wasteful and uncertain crankcase-oil changing based upon mileage or hours in service, many operators of heavy-duty construction equipment now use a better guide that saves them both time and money.

Now you can test used oil in minutes

IT HAS COME as something of a surprise to some maintenance men to discover that they have been throwing away hundreds of gallons of still-good oil . . . year after year. Conversely, it is quite a jolt to realize that a costly engine-repair job could have been prevented by an on-the-spot analysis that would have shown up the condition . . . in minutes!

The recommendations for oil changes issued by engine makers have always been computed on "averages" for the various classes of vehicle service. And like the "average" man on the insurance chart, the average vehicle doesn't exist in the actual fleet. For example, two bulldozers of the same make and model, operating on the same job, can have quite different patterns of oil economy and engine condition. Obviously no one set of rules can apply ideally to all units. And fortunately there is no longer any need for such generalization.

From a couple of drops of used oil, the Shell "ADC* Oilprint Analysis" provides a reliable check of oil condition, in minutes. It is very simple, and with a

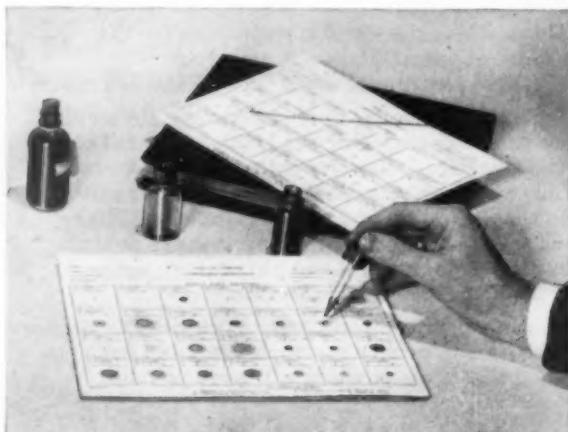
little practice, it tells you a lot about that oil and the engine that uses it.

What a drop of used oil shows: You place a drop of used oil on a piece of special filter paper supplied by Shell . . . let it stand a minute or two. You will then be able to see the following:

Water dilution: Even a tiny amount of water shows up . . . and that means not only that your oil is losing its ability to protect engine parts, but it also shows whether the water represents a normal amount of condensation or something more serious, such as an actual leakage of coolant from a faulty jacket.

Dispersancy/detergency: The same oil drop will give you a picture of how well the special additives in the oil are doing their job . . . whether or not the contaminants are being held in suspension where they do least harm . . . whether the cleansing and dispersing actions are adequate . . . whether the oil is still good.

Adulteration: The color of the oil spot will show whether too much contamination is occurring . . . and will very often point up the cause, indicating a check on



The simple test setup: sample bottles, a wire rod, a bottle of "indicator," and the permanent record card.



This single, on-the-spot sample reveals many things about an engine.



A fleet superintendent sees how easily the test is made.

injectors, nozzles, oil and air filters of diesels, or on plugs, carburetors and filters of gasoline engines.

All of the above can be learned from the single drop of oil . . . in an amazingly short time.

Alkalinity: Engine wear and engine deposits increase as the oil becomes acidic in nature due to contamination from combustion products. A special indicating fluid, developed in Shell Laboratories, tells at a glance whether oil is alkaline and still usable, or acid and how much.

Operators who keep an ADC Oilprint Analysis record of each vehicle generally find that the crankcase oil stands up longer than they had figured . . . a distinct saving in lubrication cost. At the same time, there is a running check on each engine that often detects impending trouble before its correction becomes costly. In this respect, the Shell ADC Oilprint Analysis qualifies definitely as one of the valuable recent tools of preventive maintenance.

If you are concerned with extending the service of crankcase oil, and with avoiding the risk of using oils loaded with contaminants, we suggest that you have one of the Shell service engineers demonstrate ADC Oilprint Analysis for you.

*Trademark



Photo shows an oil-spot test card...one phase in the visual life record of a charge of oil.

The Shell "indicator" shows acidity instantly. If spot turns red, oil is no longer fit to use, should be changed quickly.



SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

. . . for more details circle 269, page 16

ROADS AND STREETS, November, 1956



The Difference in OWEN Grapples



How can Owen Grapples *grasp odd shaped stones and hold them securely under seemingly impossible conditions?*

The answer is easy and logical...Owen is the *only grapple in which each tine operates independently.*

When power is applied all tines move toward the center. The one first meeting strong resistance grips and the others continue to move until each meets similar opposition. The result is tremendous gripping power and ability to grasp and hold objects regardless of their unusual shapes.

Send today for the Owen Rock Grapple Bulletin which explains this exclusive patented principle and illustrates many interesting handling operations.



THE OWEN BUCKET CO.

6030 Breakwater Avenue • Cleveland 2, Ohio
Branches: New York, Philadelphia, Chicago, Berkeley, Calif., Fort Lauderdale, Fla.

... for more details circle 236, page 16

Personals

Lt. General (Retired) EUGENE REYBOLD, recently Executive Vice-President of the American Road Builders' Association until his retirement from that position, has become special representative in Washington, D. C., for the Jay Company, division of J. Leukart Machine Co., Columbus, Ohio. This firm manufactures earth tamping and asphalt cutting and tamping equipment.

GEORGE W. MCALPIN was appointed deputy chief engineer in charge of research, New York State Department of Public Works. Formerly principal soils engineer and director of the bureau of soil mechanics of the department, McAlpin was moved to the new post as part of the basic reorganization of the department now in progress.

William P. Hofmann, an associate in the soils bureau, becomes principal soils engineer.

The department reorganization is designed to create a division of engineering and research, to be headed by an assistant superintendent, which will be of equal rank with existing divisions of construction, architecture and operation and maintenance in the Public Works department.

J. YORK WELBORN, assistant head of the Bureau of Public Roads bituminous materials laboratory, has been appointed director of the research laboratory of the Natural Rubber Bureau, Washington, D. C. Harry K. Fisher continues as engineering consultant to the Bureau.

GEORGE C. BIEHL, a consulting engineer of wide experience in highway development, died in New York City recently, age 83. Mr. Biehl, a past president of the American Automobile Association, was county engineer and superintendent of highways of Erie County, Buffalo, New York, from 1898 to 1934.

WILLIAM F. CHILDS, Jr., has joined Whitman, Requardt and Associates, Baltimore, as consultant on highways. Mr. Childs was for many years chief engineer of the Maryland State Roads Commission.

EDWARD D. SUINO has been appointed maintenance engineer of the Michigan state highway department, succeeding B. R. Downey who recently retired. Mr. Suino began with the department in 1921 as a rodman and recently has been in the Saginaw office.

New Publications

JOINT SPACING IN CONCRETE PAVEMENTS: 10-Year Reports on Six Experimental Projects. This Research Report 17-B contains reports of the condition of the pavements in the respective states, and presents a comparative study of the data. The projects were constructed in cooperation with the Bureau of Public Roads.

The experimental features common to the six state projects consist of a series of plain and reinforced concrete sections in which the joint spacing is varied. The plain concrete sections have transverse contraction joints in relatively close spacing (15 to 25 ft.) and expansion joints at 120, 400, 800 and 5,280 ft. The reinforced sections have expansion joints at 120-ft. spacing with one intermediate contraction joint. In general, load transfer devices were used in all expansion joints, but were used in only part of the contraction joints of a given project.

Previous reports on parts of this investigation have been published in Volumes 20 and 21, Proceedings of the Highway Research Board, and in Research Report 3B, "Investigational Concrete Pavements, Progress Reports of Cooperative Research Projects on Joint Spacing."

This latest summary available at \$2.70 on request to the Highway Research Board, 2101 Constitution Ave., Washington, D. C.

New booklet on stabilized aggregate shoulders

Many highway departments are considering specifications and procedures for stabilized aggregate shoulders for their heavy duty highways, and these data will aid them in planning the work ahead in the new highway program. It has been proved that stabilized aggregate shoulders are safer because the hazardous drop-off at the pavement edge is eliminated, and stability is maintained in all seasons. Moreover, the shoulders are dust free.

The new 16-page well-illustrated booklet "Shoulder Stabilization with Calcium Chloride," includes data designed specifically for the highway engineer and contractor. It includes specifications for new construction and maintenance procedures for stabilized aggregate shoulders, and established methods for their construction, reconstruction, and maintenance. Write to the Calcium Chloride Institute, 909 Ring Building, Washington 6, D.C., for your free copy.

ALLIED JET SEAL

the one joint seal that . . .

**RESISTS JET FUEL,
HEAT AND BLAST**

Allied JET SEAL will not be blown from the joints by the blast and heat of jet engines even after prolonged exposure. Nor is Allied JET SEAL affected by jet fuel, oil and solvents.

**GIVES LONGER LASTING
TROUBLE FREE ROAD SEALING**

The extreme ruggedness of Allied JET SEAL combined with its superior qualities of adhesion, cohesion, resilience and ductility at low temperatures makes it the ultimate for highway sealing. Though the initial cost of Allied JET SEAL is slightly higher it is far more economical over the long run since its expectant life is more than 250% greater than presently used materials.

**HAS NO VERTICAL OR
OVERHEAD FLOW ON BRIDGES**

Allied JET SEAL has no cold flow tendencies even at temperatures in excess of 300°F., thereby assuring that it will remain where placed. This advanced characteristic makes it possible to seal vertical and overhead bridge joints without loss of material due to gravity flow.

Allied Materials Corporation also manufactures regular joint sealing compounds meeting Federal Specifications SS-S-164 and SS-S-159. Write for additional information.

**THE PERFECT SEAL
WHEREVER CONCRETE
SLABS ARE JOINED**



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New Market, N.J.;
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. . . for more details circle 265, page 16

Rock Salt...and Today's Roads

by INTERNATIONAL SALT COMPANY, INC.—America's largest producer of salt



3-Year Survey Shows Why Rock Salt Is "Best" for Ice, Snow Removal

Early this year, the Civic Affairs Committee of The Engineering Society of Detroit completed an exhaustive study—"The Use of Salt for De-Icing Streets." Over three years of intensive work by 14 outstanding engineers went into this study—which covered representative cities across the country. Their final report is now considered to be the most authoritative ever published on the subject.

Here are some of the highlights of this important report:

Public safety—and economics. According to studies made in Detroit, severe winter storms in this city could produce staggering financial losses. Employee lateness would cost \$55 million a year . . . retail sales would drop \$26 million a year . . . trucking losses would be \$7 million annually . . . and this does not take into account huge losses from accidents, damage, decreased factory output, etc.

However, the use of rock salt in Detroit for immediate removal of ice and snow prevents these losses from occurring. And at very little expense, compared to the economic benefits to the community. For these reasons, The Civic Affairs Committee concludes: ". . . use of rock salt is by far the best procedure, and is in the best public interest. . . It is a 'modern' program geared to the problem of keeping an urban community operating in spite of adverse winter weather."

Effect of rock salt on cars. Studies were made in 12 different states in order to determine corrosive effects of rock salt on car bodies, bumpers, fender welts, etc. (The three major automo-

tive manufacturers were represented on the Committee in this work.) According to the evidence collected, The Civic Affairs Committee states, "The enamels and lacquers used on autos today are relatively unaffected by salt used on the street to melt ice and snow. Only when the finish is broken in some manner, allowing the brine solution to reach the underlying steel, will corrosion start."

Corrosion inhibitors. The Civic Affairs Committee also investigated so-called corrosion inhibitors. Their findings indicated: ". . . the use of inhibitors in salt is of doubtful value in protecting the exterior appearance of autos." It was also reported that "inhibitors are unable to prevent corrosion of susceptible parts of autos."

Effect of rock salt on utilities and other structures. In this study, the Detroit Edison Co. and the Michigan Bell Telephone Co. presented evidence to show that the economic benefits of using rock salt far outweighed any effects it may have on their equipment. "In general . . . the problems of the electric utility are not measurably increased by use of salt in de-icing streets." Also, the effect of salt on telephone utilities "appears to be of a low order of magnitude and is readily handled by normal maintenance procedures."

As far as street or highway surfacing is concerned, these general observations were made: Rock salt does not harm black top (bituminous and asphalt), natural stone, and air-entrained cement surfaces.



JUST 7 MINUTES after Sterling Rock Salt was applied—this U.S. Highway is clear and open! Traffic is moving safely despite the snowfall. On this highway—as on many others—tests have shown that just one truckload of Sterling Rock Salt covers as long a stretch of road as five truckloads of abrasives. And with this rock salt, spring cleanup expense is eliminated.

gram for your roads and streets. He'll show you actual examples of how Sterling Rock Salt has worked to speed removal of snow and ice. And he'll give you complete details on ordering, storing, and applying this quality salt product. Just contact your nearest International sales office.

IMPORTANT NEWS: Now you can store your rock salt outdoors—and still have it free-flowing when winter storms hit! A newly developed chemical agent, Sterling *Storite*, actually prevents rock salt from caking. It eliminates the need for costly structures to protect salt from weather . . . permits economical early ordering. Amazing new *Storite* is low in cost, easy to apply. Be sure to specify Sterling *Storite* with your order of Sterling Rock Salt. It's available now—shipped in 50-lb. drums.

Sales Offices: Atlanta, Ga.; Chicago, Ill., New Orleans, La.; Baltimore, Md.; Boston, Mass.; Detroit, Mich.; St. Louis, Mo.; Newark, N. J.; Buffalo, N. Y.; New York, N. Y.; Cincinnati, O.; Philadelphia, Pa.; Cleveland, O.; Pittsburgh, Pa.; and Richmond, Va.

FOR ROADS, INDUSTRY, FARM, AND HOME—

STERLING SALT

PRODUCT OF INTERNATIONAL SALT CO., INC.

FREE COPY of the complete Civic Affairs Committee report—"The Use of Salt for De-Icing Streets." A must for every official concerned with highway safety, traffic, maintenance—and practical economics. Fully documented, with graphs, charts, references. For your copy, write International Salt Co., Scranton 2, Pa.

STERLING SALT FOR ICE AND SNOW CONTROL

When you set up this winter's program for ice and snow control, be sure to check with International Salt Company—makers of famous Sterling Rock Salt. One of International's skilled and experienced "Salt Specialists" will help you set up an effective, low-cost pro-

. . . for more details circle 223, page 16

ROADS AND STREETS, November, 1956

When you bid
New Highway Program Jobs...

HERE'S THE WAY TO CUT COMPACTION COSTS —



SAVE COMPACTION TIME • LABOR • DOLLARS

with Cedarapids VIBRATORY COMPACTORS

Typical Example of Reducing Compaction Costs

Before a Cedarapids Vibratory Compactor was used on a highway job which was almost entirely new-location construction, the contractor had to remove two fill areas and then replace them, as he was unable to get the required 90% of density with another type of roller. By using the Cedarapids Compactor in the new fills, he was able to reach 90% density in one to two coverages over 4" lifts. The only time the contractor had previously been able to reach this density was when more than 16 passes were made over each lift. As he was being paid only his bid price, and no premium for compaction, his savings with the Cedarapids Compactor were substantial.

- ✓ Obtain specified density in only one or two coverages
- ✓ Compact deeper lifts (up to 36") in one pass

In the next ten years of accelerated highway construction, more dirt will be moved and compacted than ever before!

When your bid price includes specification compaction, will you use the old time-and-money-wasting method of rolling and re-rolling... OR WILL YOU CUT COMPACTION COSTS WITH A CEDARAPIDS VIBRATORY COMPACTOR?... the only pneumatic-tired compacting unit available that combines static weight with dynamic impact which imparts an additional 3% to 10% compaction over conventional static-weight rollers! Imagine a 60,000-lb. weight slammed against loose soil by a powerful vibratory thrust 600 to 1400 times a minute! It does more than just press the soil down... it actually rearranges soil particles to force out moisture and eliminate air voids. By changing the rate of vibration, decreasing or increasing the weight of the unit, and varying tire pressures from 50 to 100 lbs., the Compactor meets a wide variety of soil conditions.

Check the compaction job-report shown below... then ask your Cedarapids distributor for details about both 60,000-lb. and 25,000-lb. Vibratory Compactor models.

TABULATION OF COMPACTION TESTS			
Date	5-31-49	6-1-49	'8-1-49
Hole No.	36	38	39
Hole Location	Sta. 683 + 12	Sta. 686 + 25	Sta. 684 + 0
Hole Depth	7"	7"	7"
Type of Soil	Decomp. Granite	Decomp. Granite	Decomp. Granite
Depth of Lift	4"	4"	4"
Tire Pressure	100 lbs.	100 lbs.	100 lbs.
No. of Coverages	1-2	1-2	1-2
Speed	2½ MPH	2½ MPH	2½ MPH
Towing Unit	B-7	B-7	B-7
Percent Moisture	7.9%	6.4%	7.5%
% Compaction Std. AASHO Specified Mod. AASHO	90% Mod.	90% Mod.	90% Mod.
% Compaction Obtained	98.2%	93.3%	93.8%

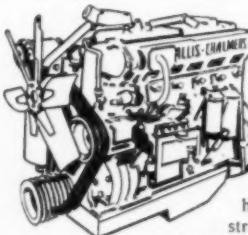
IOWA MANUFACTURING COMPANY Cedar Rapids, Iowa

... for more details circle 224, page 16

Look at the EXTRA WORK OUTPUT

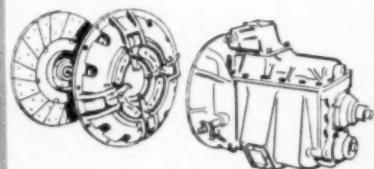
the Allis-Chalmers TS-360 Motor Scraper gives you

Here are some of the design features that put the TS-360 way out in front in steady performance, dependability and length of service life.

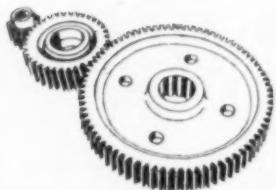


MORE USABLE HORSEPOWER.

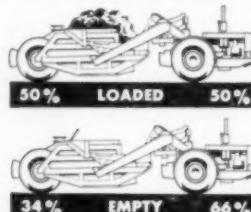
A heavy-duty Allis-Chalmers diesel engine delivers 280 hp to provide 18.66 hp to move each yard of struck dirt. This power gets the TS-360 away from the pusher fast . . . gives you speedier cycles, more trips per hour. In this engine, combustion timing and pressures are controlled for high efficiency. Air and fuel are mixed thoroughly for more complete burning. Follow-through combustion holds effective working pressures to take advantage of better crank-shaft leverage.



BIG-CAPACITY CLUTCH AND TRANSMISSION give fast, smooth operation under all job conditions. Clutch has air-actuated booster to reduce clutching effort and increase shifting efficiency. The heavy-duty transmission gives unmatched torque output in each gear range.



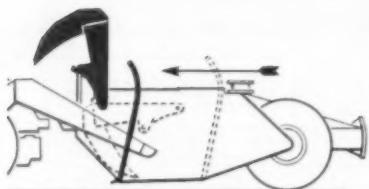
EXTRA-HEAVY FINAL DRIVES feature rugged differential assembly, carrier-housed drive shafts, final drive gears supported by large roller bearings and heat-treated drive axles. This long-life power train transmits maximum engine output for extra work volume, extra profit.



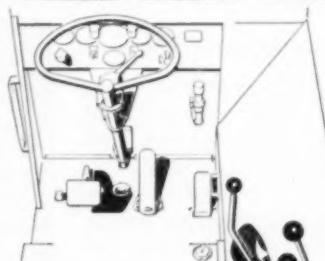
EXTRA TRACTION. The TS-360 motor scraper provides greater tractive effort, loading or traveling. Two-thirds of the empty weight is carried on drive wheels. Loaded weight is distributed equally between tractor and scraper wheels for better balance, increased flotation, safer hauling.



EASY-LOADING BOWL. Wide, low bowl design with curved bottom and offset cutting edge assures full capacity loads in less time. Curved bowl bottom "boils" dirt in, filling corners, heaping load with less spillage.



CONTROLLED DUMPING ACTION. Forward movement of ejector forces out load. High apron lift prevents material from jamming. This combination provides a continuous flow of material for a smooth, even spread.



POSITIVE STEERING. Two-stage selective power steering makes the operator's job easy . . . provides safe, feather-touch response and full maneuverability whether traveling at high speeds or in cut or fill.



OPERATOR CONVENiences add to production, too. Easy-to-reach controls, full visibility, four-wheel air brakes, roomy platform, comfortable air-foam seat are some of the features that help operator get maximum output from the TS-360.



More and more TS-360's are coming into your area every day. Ask your Allis-Chalmers construction machinery dealer where you can see them in action. Remember, too — your Allis-Chalmers dealer stocks True Original Parts and offers factory-approved service methods and factory-trained servicemen for your convenience.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

**Get all the facts
from your Allis-Chalmers
dealer—now!**

ALLIS-CHALMERS



. . . for more details circle 178, page 16
ROADS AND STREETS, November, 1956

The Only 100

PROVED IN OVER 100 MILLION

- No beefed up passenger car engine matches Reo's bigger payload power.
- No "laboratory tested" engine matches Reo's proved performance record.
- No other truck manufacturer matches Reo's 100,000 mile warranty.



REO

REO MOTORS, INC.
LANSING 20, MICHIGAN • TORONTO, ONTARIO
SUBSIDIARY OF BOHN ALUMINUM AND BRASS CORPORATION

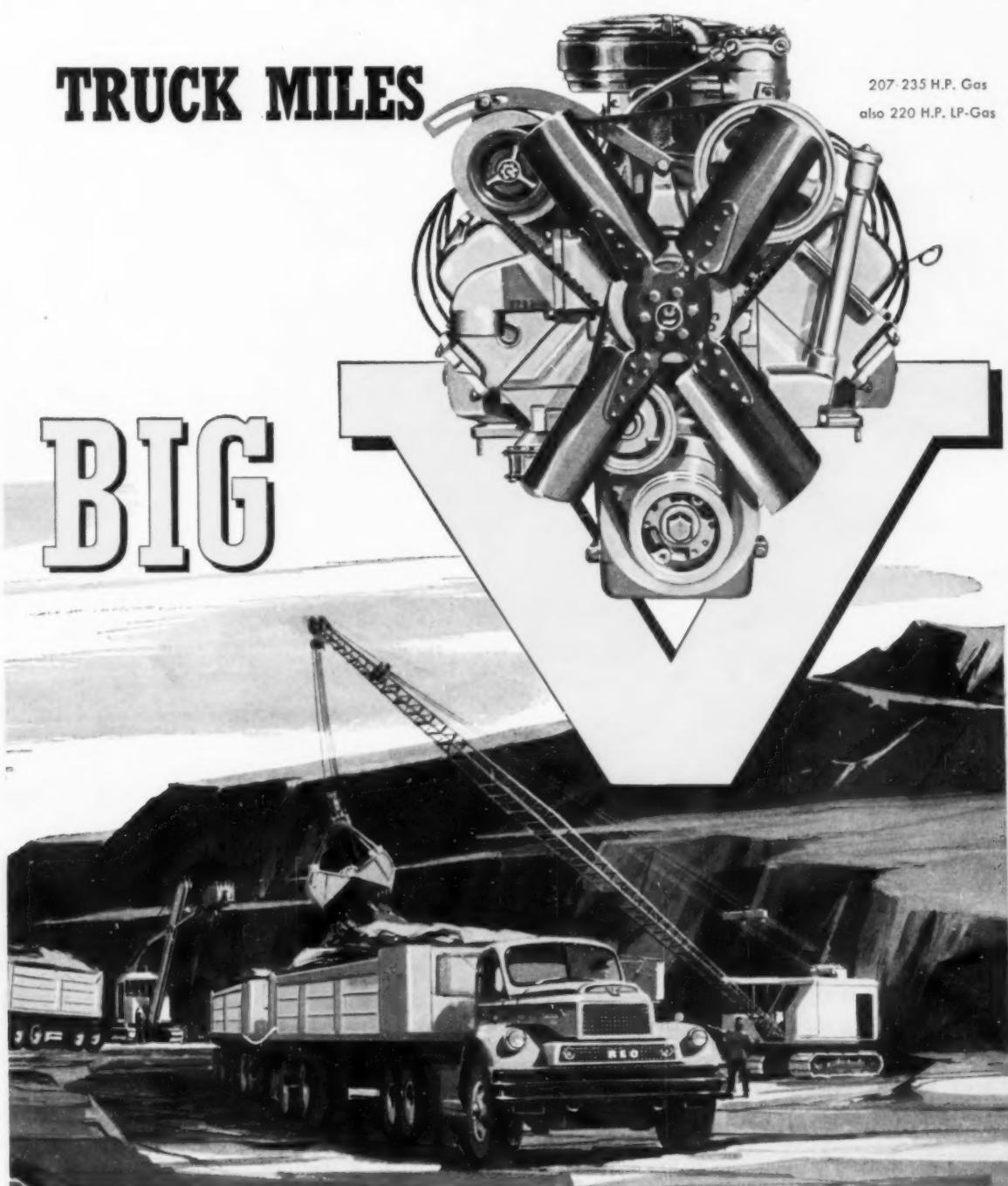
THE 100 MILLION MILE ENGINE Designed, Engineered and Built by REO

Million Mile V-8

TRUCK MILES

207-235 H.P. Gas
also 220 H.P. LP-Gas

BIG T



Tested by Truckers, and Backed by REO'S 100,000 MILE WARRANTY

... for more details circle 240, page 16

ROADS AND STREETS, November, 1956



Dump in one second with Dumptor®

On the above operation, Koehring Dumptor drives up to the hopper, body forward. Operator trips the body-release lever, and *gravity* tilts the 6-yard body 70 degrees. One second later the load is out, and Dumptor is on its way back for the next load. Because there is no waiting for slow-acting body hoists, *gravity-dumping* saves 15 to 25 seconds on every round trip. This adds up to a substantial increase in extra yards per hour. For instance — take a typical 1,000-foot haul, where you normally would make 16 trips an hour. By saving an average of 20 seconds dump-time on each trip,

Dumptor gains 320 seconds, or 5.3 minutes more productive haul-time an hour. You get 17½ trips, instead of 16. This, alone, adds 9% to hourly production. What's more, there are no expensive hoist-replacement parts, or hoist maintenance time. *Gravity-dump* never wears out, never balks. You get the same one-second dumping *every time*, under heaviest loads, in all temperature extremes. Better check what this can mean in lower costs, and increased production on your hauling operations. Get the complete Dumptor story from your local Koehring distributor. *Call him today.*



Plenty of power on the haul — You get better than 6 h.p. for every ton of loaded weight when you haul with heavy-duty Dumptor. That's why it accelerates fast, pulls through soft ground, up ramps and grades with less shifting — climbs 24% grades fully loaded. When hauling heavy materials, extra horsepower means extra load-carrying capacity.



No-turn shuttle hauling — Dumptor solves problems of operating in tunnels, along overhead trestles, or narrow haul roads. There is no need to turn, because it travels with equal ease, power and speed in either direction. No-turn hauling offers a big production advantage, too. Every turn saved cuts 15 seconds off cycle time, increases output.



Easy-loading target — Big, 64 square-foot body opening permits loading Dumptor over the side or either end. This saves spotting time, reduces spillage. Heavy duty body is built for rock. Top edge and bottom are box-beam constructed. Sides and ends are rib-reinforced. In fact, Dumptor has a ton of strength for every ton of payload capacity.



Time-saver on stockpiling — Dumptor puts stockpiling on a fast shuttle-haul basis — eliminates turning on top of pile. Notice how instant dumping action kicks the load out over edge of pile — saves a lot of dozer clean-up. Free-swinging kick-out pan breaks load suction in wet, sticky materials, bolts down to floor when handling rock.

KOEHRING COMPANY, Milwaukee 16, Wis.

... for more details circle 226, page 16

ROADS AND STREETS, November, 1956

Subsidiaries: PARSONS
KWIN-MIX • JOHNSON
KOEHRING-WATEROUS LTD.





You can't tell the difference?

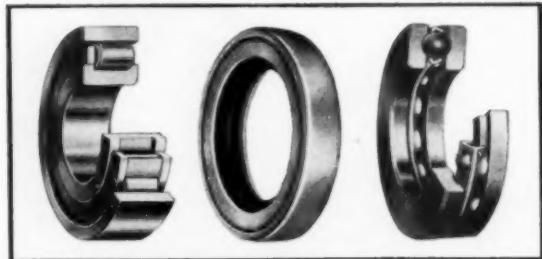
Take a substitute anti-friction bearing. Probably looks exactly like a Caterpillar part. But remember, there are many different bearings that fit a shaft and bore, yet only *one* may be right for maximum performance—the one designed especially for the machine—the one tested, specified and supplied by Caterpillar.

The same with seals. While seals may look alike, the material can vary in tensile strength, resiliency and hardness. CAT® lip-type seals meet *special* standards that assure the long-life reputation of Caterpillar machines. They are *matched* to the parts they protect. They're *right* for their particular job.

Why take chances with substitute parts? You're sure of finest quality and *maximum life* with Caterpillar parts!

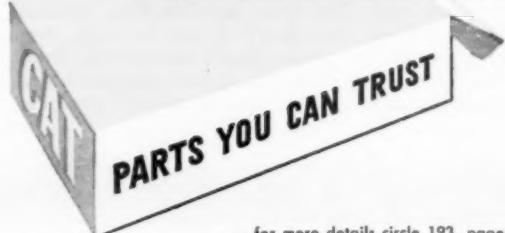
Better see your Caterpillar Dealer's Salesman—and get Cat original parts every time.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.



Each Cat anti-friction bearing and lip-type seal has been proved best for its particular application. Each one is assigned a Caterpillar part number—used only for that part in that application. Can you be sure with so-called "will-fits" and "look-alikes"?

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.


... for more details circle 193, page 16

ROADS AND STREETS

At Selfridge Air Force Base,

Largest-Yet Application of...

Thin Bonded Concrete Overlay Pavement

By Hubert C. Persons, Contributing Editor to Roads and Streets

THIN bonded concrete resurfacing has been applied to a 45,000 sq. yd. area of old concrete pavement at Selfridge Air Force Base, Mt. Clemens, Michigan. This work, carried on during the past summer, is the most extensive use yet made of this recently developed technique for restoring the surface of old concrete. Thin bonded concrete resurfacing may be adopted by the Air Force as a standard procedure for repair and general restoration of concrete pavement surfaces.

The new resurfacing method was discussed in detail by A. A. Anderson, chief highway consultant of the Portland Cement Association, at the 2nd Annual Airfield Maintenance Conference held in May at Colorado Springs, Colorado. The present method of applying thin bonded concrete resurfacing is the result of several years of laboratory and field experiments conducted by the Portland Cement Association.

Work at Selfridge Air Force Base was started on May 21, 1956. The first contract was for 30,000 sq. yd. This was awarded to M. B. Salisbury, Inc., Topeka, Kansas, at low bid of \$3.49 per sq. yd. A supplementary contract for an additional 15,000 sq. yd. has since been awarded to the same contractor. There were three other bidders.

The contract was awarded with the approval of the Air Defense Command at the Colorado Springs headquarters,

John Arnett, principal pavement engineer. Supervision was under Major E. M. Franklin, Installations Engineer, and O. B. Thompson, principal engineer of the Air Installations Office at Selfridge Air Force Base. Specifications for the resurfacing called for a nominal thickness of 1½ in. and a minimum thickness of 1 in.

Some of the original pavement was a part of Joy Field. A portion of it was built in the depression years and another part during World War II.

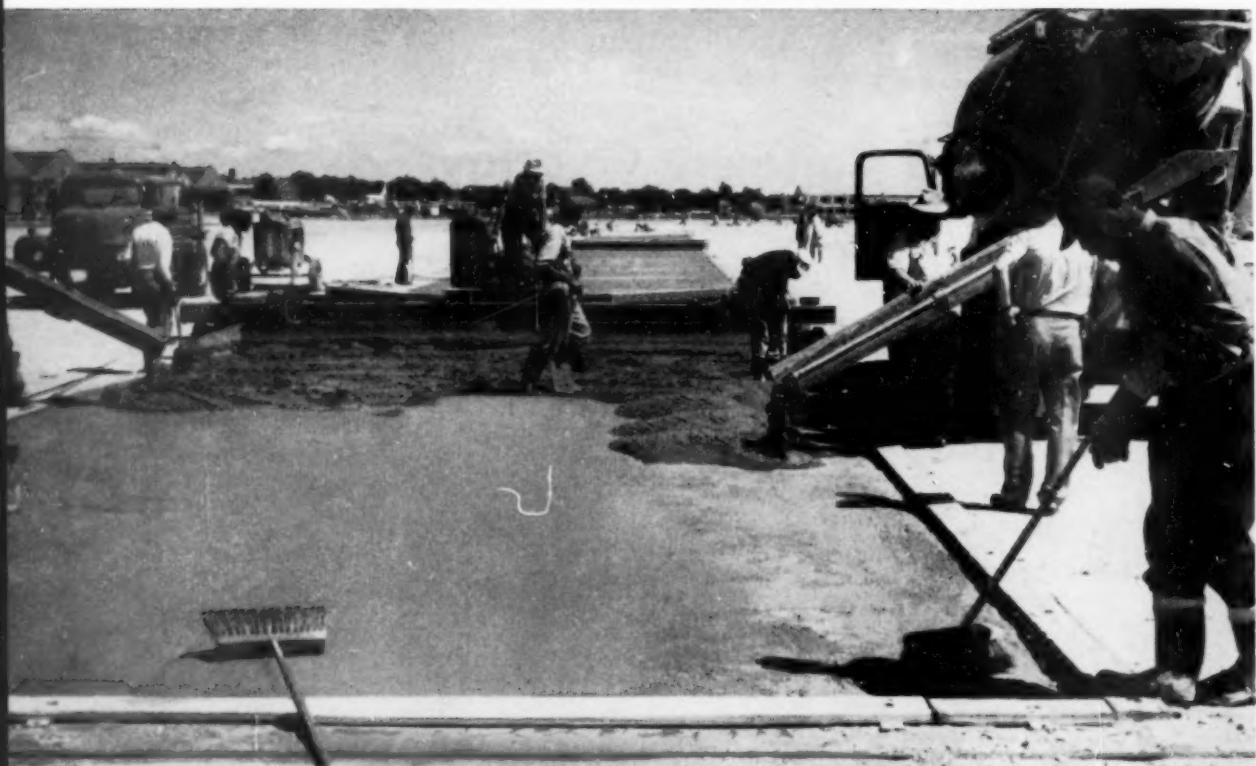
- Blowing off water with air.
- Applying acid for etching the old surface. Machine at right is a generator used to power the acid spraying equipment.





Some of the Overlay

- Wetting surface before acid application.



- Concrete was delivered in truck mixers, two placing from opposite sides, followed by a spreader with two screeds.
- Spreading grout prior to concreting—one of the essential steps in securing a good bond.



Methods, and the Completed Job

when it became a military airport. The resurfaced pavement is an apron area. Part of it included 10-7-10-in. thickened edge lanes 20 ft. wide and some 6-in. uniform thickness lanes on the original E-W runway. The resurfacing was placed with longitudinal and transverse joints coinciding with the original joints.

- First Step in preparing the old pavement for resurfacing was to plow out all the jet fuel-resistant sealer used in the joints. Then the bituminous material adjacent to the joints was removed with a Tennant scarifying machine. Except for two lanes and the



• Showing how resurfacing was done in alternate lanes.

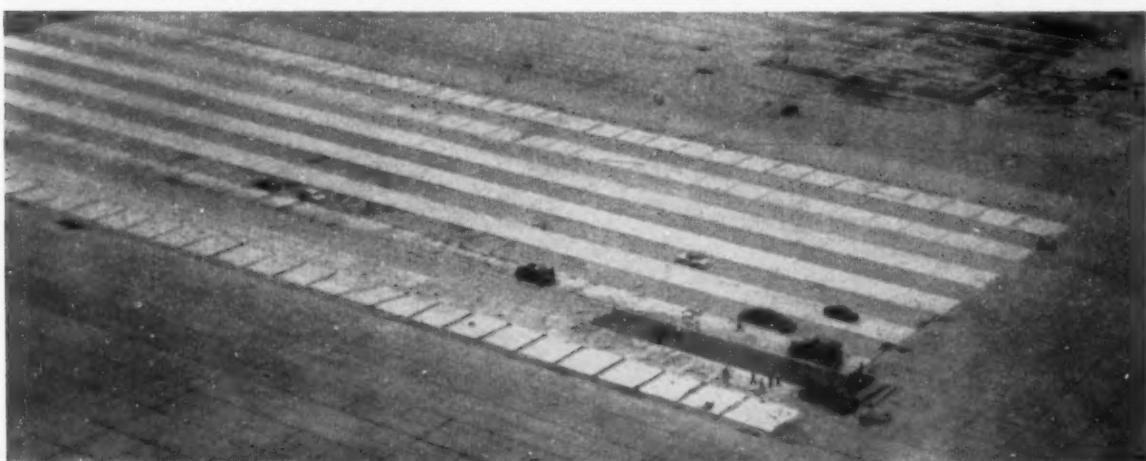


- Note ramp lane (at left of joint) extending from old slab grade to level of resurfaced slab.



• Sawing contraction joints in finished job.

- Aerial view of site during resurfacing work. Transverse lines across the edge slab indicate wet burlap to cure sawed joints.





• Showing uneven joints in the existing concrete, and Tennant machine beveling old concrete at slab edge.

old runway area, the entire area of the old pavement was scarified to a depth of $\frac{1}{8}$ in. to $\frac{1}{4}$ in. These sites were scarified only sufficiently to remove loosened surface material and any spots of bitumen. The surfaces of the areas where scarifying was omitted were

sound, and for the most part free of any loose surface mortar. These areas are expected to provide a means of comparison to determine to what extent, if any, omission of scarifying has on the durability of the resurfacing.

After scarifying, the pavement was

washed with a detergent where necessary, to remove all traces of oil drippings and any other foreign matter. After washing, the detergent was flushed from the pavement using a tank truck equipped with a spray bar.

The next step was to etch the pavement with 20 deg. Baume, commercial muriatic acid applied to the wet surface. It is in this acid operation that a definite advance has been made on this project as compared to methods used earlier. The acid was applied from a tank truck by Pressure Vessel Service, Inc., of Detroit, Mich. This eliminated the handling of carboys or other containers of acid as was necessary in earlier work. With an electric pressure pump on the tank truck, acid was spread on a 10 ft. strip 100 ft. long in 30 seconds. One gallon of acid covered 100 sq. ft.

When there was no longer any surface foaming, indicating that the etching action had stopped, the area which had been treated with the acid was again thoroughly flushed with water under pressure until the wet surface showed a neutral reaction to pH paper.



• Drilling in old concrete for anchoring of wood side forms.

• Scarified surface being flushed to remove acid.



• Cleaning off scarified slab with compressed air.

The succeeding step, which is the application of a bonding course, requires that the old surface shall be damp but with no evidence of free water. On the Selfridge project, a bonding grout consisting of equal parts of portland cement and sand was mixed to about the consistency of heavy paint, in a paddle-type mixer, and distributed over the pavement by hand from buckets. The grout was then brushed in thoroughly with rattan street cleaning brooms, leaving a coating $1/16$ to $1/8$ in. thick. Special care was taken to synchronize the grouting operation with the paving so that the resurfacing concrete could be spread before the grout became dry.

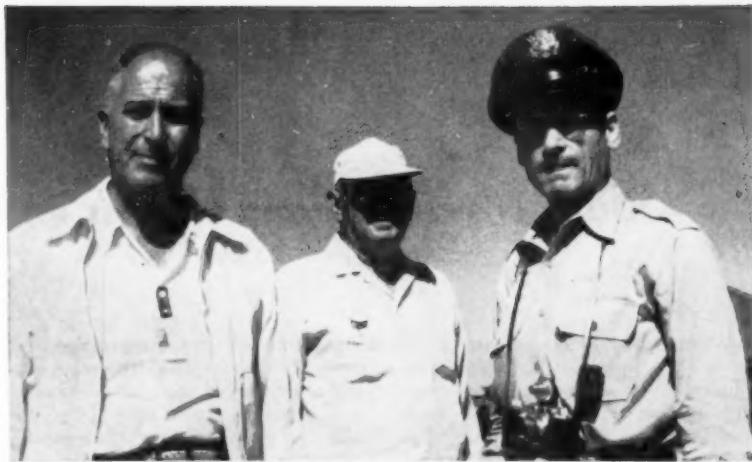
The aggregates in the concrete consisted of 40 percent dolomitic limestone, maximum size $\frac{1}{2}$ in., and 60 percent by weight of concrete sand. The cement factor was 7.6 sacks per cu. yd. This gave a workable, plastic mix with 5 gal. of water per sack of cement. Darez air-entraining agent was added at the mixer to produce 7 to 8 percent of entrained air.

- **Transit Mix Delivery.** The concrete mix was proportioned in a central plant $2\frac{1}{2}$ miles from the project and delivered to the field in 6 cu. yd. transit truck mixers. Two mixers dumped simultaneously on opposite sides of a 20 ft. lane. It was found that 1 cu. yd. of the concrete mixture provided proper thickness for 11 lin. ft. of a 20 ft. lane.

Initial Finishing

Initial finishing was done with a Blaw-Knox double screed self-propelled finishing machine moving on rubber tires outside the wooden sideboards. The wood forms were bolted down firmly by lag screws. These were set into lead inserts in holes drilled in the concrete about 5 ft. apart. Drilling was done with electrically driven star drills. The wood side forms were required to support only the screeds. After two passes of the finishing machine, 10 ft. straight-edges and long-handled floats were used in leveling off. Final finish was put on with a burlap drag.

Transverse expansion joints were formed into the surface during placement of the resurfacing at the exact location, and of the same width, as the original joints. Intermediate contraction joints were sawed through the entire depth of the finished resurfacing directly above the old contraction joints. A composition blade in a gasoline operated rig was used in cutting these joints. Exact locations of the old joints were marked on the forms



• Left to Right: O. B. Thompson, principal engineer, Base Installations office, Selfridge AF Base; A. A. Anderson of PCA, and Major E. M. Franklin, Installations Engineer.

and adjacent pavement and transferred to the finished surface by means of a wire cable attached to nails in the side forms and stretched over the concrete.

Curing was aided by Truscon white pigmented compound. It was sprayed on the pavement with a power operated pump.

Previous field projects in 1954 and 1955 on which thin bonded concrete resurfacing was applied included a 780 ft. long section of the Pennsylvania Turnpike; a 1,500 ft. section of U. S. Highway 34 near West Burlington, Iowa, and part of a construction lane in the apron area at the Little Rock Air Force Base.

- Driving battered pipe pile on Oklahoma project.



Foundation pipe piling for Oklahoma bridges

What is believed to be the first straight foundation pipe piling used in Oklahoma is being driven by Boecking Construction Co., Inc., for foundations on three of the six bridges the firm is erecting on the Oklahoma Turnpike.

With a specified bearing capacity of 30 tons per pile, the piling is being driven to 50 ft., in two rows for each foundation, the front row battered. The piling is supplied by the L. B. Foster Co. in 28 to 54-ft. lengths, with an over-all diameter of 14 in. and a wall thickness of .1644 and .179.

EDITORIAL

Dust, Disruption and Danger on Urban Projects

When the contractor moves in on an urban expressway job, the community is bound to suffer some inconvenience. You cannot tear down homes and buildings, do blasting and move dirt with today's big equipment without disturbance. Material must be trucked through the streets. Detours of some duration are often necessary.

We ask: have highway departments and contractors done a good enough job of advance thinking, and follow-through, to see that the interest of neighbors is properly considered during construction in built-up areas? Or to win their friendly cooperation? In many cases there is evidence that they have not.

Admitting no two jobs are alike, surely basic procedures can be spelled out and a job plan tailored for each job to safeguard the public and maintain good "public relations". It will pay everybody in the long run.

• Today we are seeing this whole problem in new magnitude as the new federal highway program brings a stepping up of city expressway work. The problem is already with us on an unprecedented scale, witness the recent experience along the Connecticut turnpike. This highway with its large earth and rock quantities and many bridges passes through a succession of shore communities.

The Connecticut turnpike contractors got into the headlines last July when a blast from an adjoining excavation went haywire and disrupted service on the New Haven Railroad's busy commuter line. Several injuries were caused by showering rocks. The fact that this particular contractor is one of the nation's most experienced in close-quarter blasting couldn't undo the damage or wipe out the litigation that followed. In the public outcry of course none thought to give the contractor any credit for his otherwise generally good job management.

This blast triggered action by gov-

ernor Ribicoff, who ordered rigid enforcement of state regulations pertaining to explosives. Belated recognition was given to the magnitude of the blasting problem along the turnpike, which (see Sept R & S) is requiring over eight million cubic yards of rock excavation on the various contracts. A conference was called by highway commissioner Newman E. Argaves, which brought together fifty contractor representatives. As related in New York newspapers, they pledged a program of "safety regardless of progress". Powder companies stationed engineers on all jobs.

• Despite redoubled precaution, at least one more hazardous blasting incident was reported in the following weeks. It also came out that earlier blasts on various contracts had caused concern, and that a minor epidemic of complaints had been received from property owners over noise, vibration, dust, big trucks and other aspects. Norwalk police reportedly barred Sunday and night blasting. Several communities campaigned against speeding company-owned pickups and overloaded trucks. The New York Times on July 29 said, "many Connecticut communities have complained that drivers of lumbering vehicles have raced along narrow, winding roads, endangering pedestrians and motorists". Police made some arrests in an effort to force a slow-down.

The Connecticut highway department experience in coping with contractor exuberance on this big project should be pooled with similar experience gained in other states, and lessons reviewed for the entire highway industry. A canvas of local experience would bring to light much constructive action. For example, as will be described in a forthcoming article, a Los Angeles contractor recently sent representatives around to the neighborhood before beginning work on a free-

way project, to explain that some blasting was going to take place. Property owners were shown how the blasting was to be done, using vibration-reducing (millisecond delay) methods and every safety precaution. This strategy paid off in good will, and undoubtedly saved work for the firm's legal department.

Another example of advance action is the kind used at Houston when the state first got started on the Gulf freeway. We recall that every bidder was briefed on the special requirements considered necessary because of the urban nature of the job, so that he would know clearly what was expected of him. This job was a model for its good public relations, satisfactory contractor-engineer relationship and quality workmanship.

Much work toward better job safety procedures has of course already been done by official groups. Of particular interest is the new Manual of Construction Sign and Barricade Practice, recently prepared by an inter-industry committee. Contractors can contribute much in other areas of thinking, and possibly such groups as the ACC-AASHO joint cooperative committee and chapter committees have already made good progress in clarifying job regulations pertaining to public safety and convenience.

• Contractors are as anxious as engineers to perform road work in a manner that will leave a good community feeling in its wake. The contractor, however, is a realistic fellow. He is in business to make money. His instinct and that of his men is to get production, and his methods are based on the existence of counterpressures by the engineers and inspectors to see that the work is done right. Doing it right today on urban projects calls for a detailed procedure for public protection, the importance of which must be fully understood by every man in the field.

Aluminum widely used on Florida turnpike

The Miami-to-Jacksonville Florida Turnpike, the first leg of which is scheduled for completion in January, 1957, will use more aluminum per mile than any other highway project in history. Now being installed are aluminum signs and sign posts, aluminum light standards, and aluminum bridge railings. Reynolds Metals Company is supplying the aluminum. Major components of the signs, the sign posts, the light standards and the bridge railings all are manufactured by the extrusion process. The signs are composed of new-type interlocking aluminum panels.

Progress in accident prevention on bridge work

The value of on-the-job safety training and management on construction work was spectacularly spotlighted by a report on the Richmond-San Rafael Bridge, now nearing completion across an arm of San Francisco Bay.

This project involving 4½ miles of bridge over water, has been built with only two fatalities, one of which is believed to be due to a heart attack. According to Otto Holmskog, construction specialist for the insurance company, Employers Mutuals of Wausau, Wisconsin, this is in spectacular contrast with the black record of deaths in building the other bridges in the Bay area.

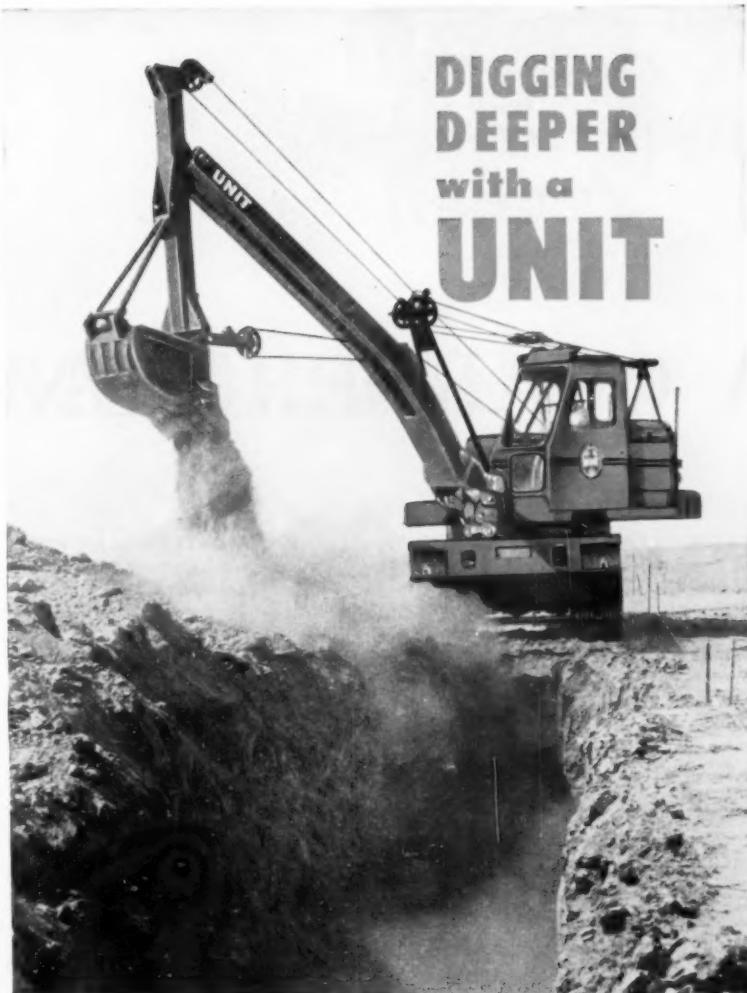
San Francisco Bay Bridge erected during the depression years took 24 lives, and the Golden Gate Bridge 15 lives. The safety record on the Richmond-San Rafael Bridge is chalked up partly to the use of safety nets, which are known to have saved the lives of workers in eleven instances. And hard hats required on this job saved at least eight fatal head injuries, according to the records.

Land values frozen along Maryland highway

The Maryland State Roads Commission announced that it will make its first use of a new law permitting it to curb road right-of-way land speculation.

The Commission has filed in Rockville Circuit Court to freeze values on land needed for widening Route 240 in the area.

By filing a right-of-way brief in the Court, the Commission can then take immediate possession of the land at its present value, but must deposit with the Court a sum equal to the appraisal of the land.



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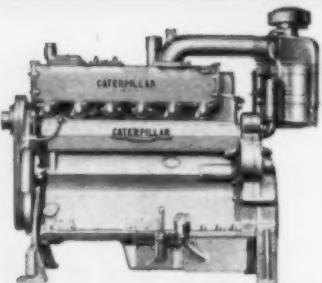
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Geared to Produce Maximum Yardage



... for more details circle 261, page 16



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A CATERPILLAR FIRST

—the "Hi-Electro" hardened cylinder liner



A CATERPILLAR FIRST

—the chemically conditioned cylinder liner

A CATERPILLAR FIRST

—the stainless-steel piston protector



A CATERPILLAR FIRST

—the steel-backed aluminum bearing

A quarter of a century ago, Caterpillar created mobile diesel power. For the first time, the power of the diesel engine was unleashed from its bulky foundations and put to work in the field—compact, economical. Here was diesel power of simple design, with no need for experts to operate and maintain. Here was diesel power with the lugging ability to knuckle down to the tough jobs.

The introduction of mobile diesel power was a tremendous advance in many fields. It provided efficient diesel power for tractors, motor graders, earthmoving equipment . . . for the work boat, the gin, the locomotive, the oil rig, the municipal plant . . . for *any* application in which steady, low-cost power is crucial. And everywhere, CAT* Diesel Engines proved themselves durable and dependable. They established Caterpillar as the leader in diesel engineering.

Today, hundreds of thousands of modern heavy-duty Cat Diesels are on the job in every corner of the world. And still the research continues. Study and experiment go ahead constantly in Caterpillar laboratories. Special testing machines help point the way toward new advances. Manufacturing techniques improve, too, in the world's largest diesel engine factory—where the quality of workmanship is the standard for the industry.

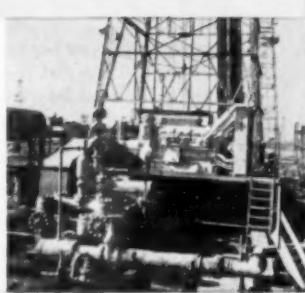
A modern world must have modern power—more and more of it. It is coming, in ever increasing quantity, from the production lines of Caterpillar, the leader.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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—interchangeable, adjustment-free
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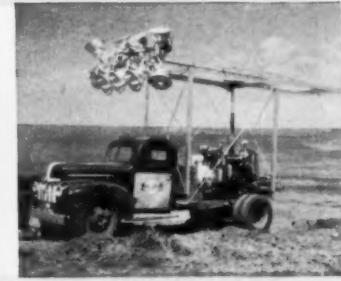
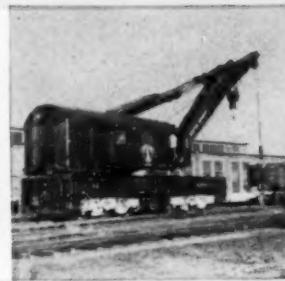
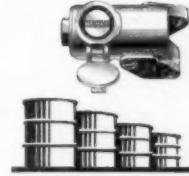
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without question, and with loads of proof *

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Compare these facts and figures: the Miti-Mite delivers its full rated capacity *around the*

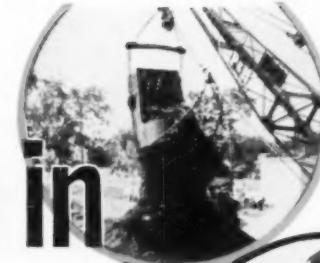
full 360° for complete flexibility . . . the Miti-Mite is rated at 8-ton crane capacity at 12' radius . . . has an 11 cubic foot shovel capacity and a maximum trench hoe width. And for crane use the Miti-Mite can handle a 50 foot boom with a 15 foot jib. These are the features you want in a truck crane for real capacity and high earning power—you'll find them only in the P&H Miti-Mite.

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TRENCH HOE

Gooseneck boom permits greater digging depths and dumping heights. Performs in rock, hard pan, heavy shales, works in laterals, septic tank areas.



DRAGLINE

Full-size heavy-duty bucket is used by the Miti-Mite dragline attachment. For longer reaches, inserts in 5 and 10 foot lengths are available. Lattice-type boom provides strength without excess weight for faster cycles and greater payloads.



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Exceptional stability means faster operation with greater safety. Planetary boom hoist is standard. Boom point of the gooseneck is open-throated for maximum boom load clearance. 8-ton capacity at 12' radius.



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Power Crane & Shovel Division

... for more details circle 267, page 16

ROADS AND STREETS, November, 1956

Unique Sand Fill Method Carries Turnpike Grade Across Lake

By C. R. Shupe

De Leuw, Cather & Company, Consulting Engineers, Chicago, Illinois

Dewatered lake bed excavated in the dry in plan devised by contractors to carry Indiana Toll Road across shallow water area.

DURING April of 1955, bids were opened for the construction of Contracts C-1 and C-2 of the Indiana (East-West) Toll Road. These two contracts, totaling 4.4 miles, to be constructed entirely on fill, required approximately two million cubic yards of borrow. Low bidder on the project was D. W. Winkelman Company, Inc., and A. L. Dougherty Company—a joint venture. The J. E. Greiner Company, of South Bend, Indiana, is the over-all consulting engineer for the Indiana Toll Road Commission. De Leuw, Cather & Company of Chicago are the contracting engineers in charge of the design and supervision of construction of these two contracts. Location of this project is indicated in Fig. 1.

Several alternate combinations of materials for embankment were provided in the special provisions, to permit the contractor sufficient latitude in the selection of borrow areas.

Embankment Materials

The materials permitted in combinations for embankment included dune sand, Wolf Lake sand, and air-cooled blast furnace slag. The terrain surrounding the proposed centerline has been, over a long period of years, man-made. In general, it is seldom more than 2 ft. above ground water elevation. For this reason borrow pits sufficiently large to produce the required earthwork were not practical.

As shown in Fig. 2, the toll road crosses Wolf Lake for a distance of more than a half-mile. An artist's conception of this crossing is shown in Fig. 1.

It has been a "someday" dream of the city of Hammond to deepen, dress up, and develop a recreation area on the eastern shores of Wolf Lake. The question arose—why not excavate Wolf Lake to a depth which would supply the necessary two million cubic yards? This deepening of the lake would be in harmony with the future plan of the city of Hammond.

After negotiating with the state of Indiana and the city of Hammond, Winkelman-Dougherty elected to excavate as planned—and Wolf Lake



• Earthmovers and draglines at work during the height of the 1955 season.





• Artist's conception of the lake crossing, prepared in advance of the work to aid in developing and getting acceptance of the route location.

sand was destined to become part of the foundation for this segment of the toll road.

Wolf Lake is comparatively large in area but very shallow; it is fed by water discharged from surrounding industries. Normally, the lake is only 2 to 3 ft. in depth and wading across it presents no problem. The lake bottom is a fine sand to a depth of 20 to 25 ft., where clay is encountered. The sand is a uniform lacustrine deposit classed as an A-3 (0) by the Highway Research Board classification system. The maximum density of this material is 106 lb. per cu. ft. and the optimum moisture is 6 percent.

Following the choice of Wolf Lake sand as the most desirable material, the next step was to move the sand in an economical fashion. Dredging was considered, but the idea was abandoned because of the high cost of setting up this operation. The old

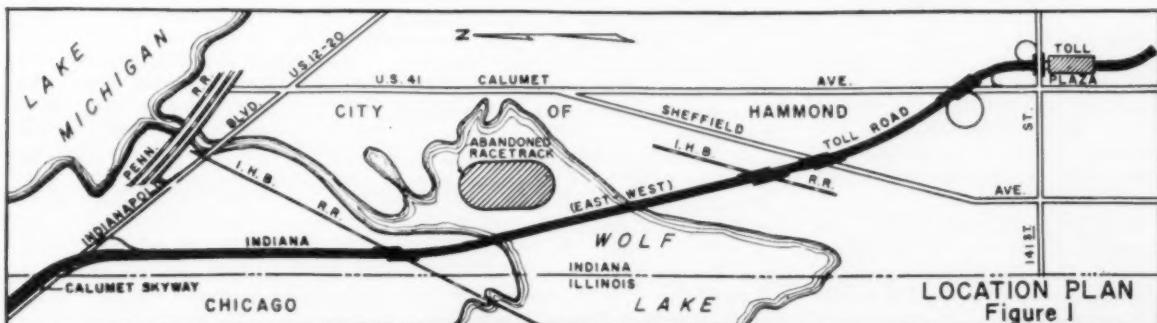
Hammond race track (Fig 1) — slightly submerged — generated thoughts which led to a major and unique excavating operation. The abandoned track was built up above water level to form a combination dike and haul road; the water was then pumped out and the material within the area was excavated. Four major areas, diked off by haul roads, contributed to the total borrow operation (Fig. 2).

Draglines and Scrapers Used

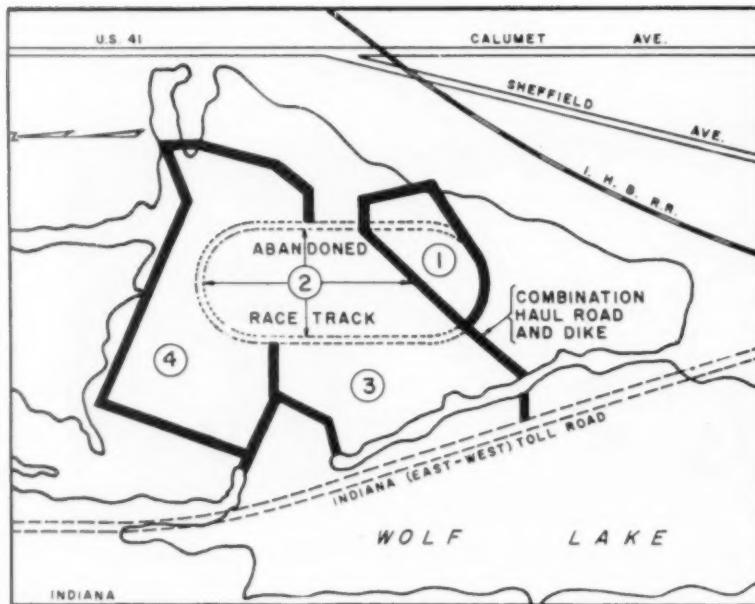
During the early stages, draglines and scrapers were used to excavate the drained sand. However, it was reasoned that Euclid loaders might also be effective. Euclids eventually appeared on the site and were soon working two shifts a day, moving sand with the rapidity normal to this type of high production equipment. During this early set-up, pumping

operations were performed from the surface. This procedure left the bottom of excavation with too high a water content to permit easy operation of equipment.

A trench was dug adjacent to the diked section, pumps were set in this trench, and the water table was then lowered well below the bottom of the borrow pit. This operation also proved impractical in that the sand was then too dry, making it necessary to water the fills to secure compaction and hold down the dust on the haul roads. After experimenting for some time, it was discovered that if the water in the trench around the diked-off section was maintained at a level, such that the water table in the excavated section was approximately one foot below grade, the material could easily be excavated and placed on the embankment. This method obviated the necessity of additional water and



• Figure 1. Location plan showing new turnpike line in relation to the lake and the old race track which was eventually utilized in the job procedure.



• Figure 2. Sequences of diking and filling, and location of haul roads for the Wolf Lake project, in relation to the old race track area.

provided a stable condition in both borrow pit and fill section.

While excavation was being carried on in Areas 1 and 2 (Fig. 2), draglines were constructing the haul road-dike combination for Areas 3 and 4. As winter approached, excavating operations were temporarily hampered. The high water-content material was freezing overnight. The upper crust being peeled off by the Euclid loader consisted primarily of frozen sand.

The use of bulldozers operating in the borrow pit to remove frozen material in front of the Euclid loaders was abandoned as uneconomical. The excavation procedure was revised to make full use of draglines, whereby at least a 10-ft. face was worked at one time, the frozen crust being cast to the side.

Weather Trouble

Weather continued to create difficulties—each morning before starting embankment operations, it was necessary for the contractor to remove frozen material from the grade. To overcome this costly delay, the contractor set up a round-the-clock schedule of three 8-hour shifts.

To insure suitable embankment operations during these winter months, the grade was constructed in a somewhat diverse manner. A small section of the embankment—less than 300 ft. in length—was brought up to grade, thereafter the front slope was con-

tinuously built up at the same time as the embankment section. This profile always presented a fresh, unfrozen surface on which to work; it also proved to be an excellent down-grade dump for the bottom-dump Euclids—the most advantageous method when working in sand.

Equipment Used

Equipment used during the major part of winter operations consisted of 3 draglines with 2½, 3½ and 4½ yd. buckets, 16-bottom-dumps, 4 bulldozers, 1 motor grader, and a 50-ton pneumatic roller. There was one 8-in. and two 10-in. pumps working 16 hours a day to maintain the lowered water level in the borrow pits. The dike haul roads were constructed of fine sandy material, about 30 ft. across the top. Although water seeped through at a very slow rate, maintenance was not a problem. Normally, well points would have been required for this type of excavation operation. Through careful planning and close observation, however, the need for well points became unnecessary.

In this unique operation, a total of 111 acres were diked, dewatered and excavated. Thus, Wolf Lake made its contribution to the Indiana Toll Road.

Project manager for the Winkelmann-Dougherty venture was K. S. Kurtenacker. Project engineer for De Leuw, Cather & Company was R. E. Fetterman; soils engineer, M. H. Salisbury.

Institute warns of children vs. blasting caps

As part of its continuing campaign to safeguard children against the dangers of blasting caps, the Institute of Makers of Explosives is distributing a new poster and pamphlet to contractors, miners, quarry operators and other users of commercial explosives.

Designed for use on bulletin boards, magazines and tool sheds wherever blasting caps are used or stored, the four-color poster warns: "Blasting Caps can cripple and blind! Lock 'em up so kids can't get at them." The accompanying pamphlet drives home the fact that blasting caps are safe in experienced hands, but dangerous to children.

For more than 30 years, the Institute—an association of commercial explosives manufacturers—has spearheaded a nationwide safety program to eliminate blasting caps mishaps. One phase of the campaign is directed at alerting boys and girls to the hazards of playing with caps. In support of this effort, the Institute has had the assistance of the schools and teachers of the country, the Boy Scouts and Girl Scouts, The National Sheriffs' Association, the International Association of Chiefs of Police, the International Association of Fire Chiefs, 4-H clubs, Future Farmers of America, the U. S. Post Office, the Bureau of Mines, radio and television stations, newspapers and magazines.

At the other end of the chain of circumstances that leads to these unfortunate mishaps, the companies and men who regularly use dynamite and caps are cooperating wholeheartedly in a drive to keep caps from falling into the hands of children. Precautions for safe handling naturally vary by industry.

The problems of a miner are different from the contractor or layers of pipe line. But wherever caps are used "play it safe" is the watchword.

The effectiveness of the work on these two fronts is clearly shown by the decline over the years in the number of children injured in these tragic accidents.

In spite of the steady rise in the use of commercial explosives and the country's ever-increasing child population the accident rate has been cut from 0.76 per million pounds of explosives back in 1928 when this work was started to 0.12 last year. But the task is never-ending.

New groups of children come along every year and if efforts are relaxed the accidents are sure to increase.

Lock up your caps, so children can't get hurt.

Now!

The capacity and mobility you need to handle excavating jobs for less!



F. M. D. Tractor-Loader gives you $\frac{5}{8}$ yard bucket capacity. A touch of a lever and double-acting cylinders on lift arms and bucket deliver positive down pressure . . . over two tons of breakaway power . . . 2000 lbs. load capacity at full lift. Easily attached blade makes it an excellent unit for backfilling, grading and dozing.

Low-Cost FORDSON MAJOR DIESEL

The right combination of capacity and mobility makes the Fordson Major Diesel today's best power buy for many types of ditching, trenching and excavating jobs. Here's what we mean:

Equipped with a backhoe, the Fordson Major Diesel can dig as wide as 3 feet, as deep as 12 feet. It swings a full 180 degrees, has plenty of reach to load high-bodied trucks. Fast, positive hydraulic control makes accurate digging easy.

Though big and rugged for work in adverse conditions, the Fordson Major Diesel is exceptionally maneuverable . . . easy to handle in close quarters and over rough ground. It's also highly mobile, lets you handle several jobs a day in different locations.

You can check the complete specifications of the low-cost Fordson Major Diesel by calling your nearby Ford Tractor and Equipment Dealer. Or, write to:



. . . for more details circle 207, page 16

ROADS AND STREETS, November, 1956

**TRACTOR AND IMPLEMENT DIVISION
FORD MOTOR COMPANY**
Birmingham, Michigan

All-Time 24-Hour Earthmoving Record?

BY MOVING 145,000 cu. yd. of earth in a single 24-hour period recently, Western Contracting Corporation, of Sioux City, Iowa, established what is believed to be an all-time world wide record for load-and-haul earthmoving on a single contract job in a single day.

Highway builders and heavy contractors have shown keen interest in this achievement, which was performed in building Oahe Dam in South Dakota. The record day was May 16, 1956, and the yardage was accomplished in two 10-hour shifts. When completed this dam will be the second largest earth-fill dam in the world, with 78,000,000 cu. yd. of rolled earth fill.

The record yardage was accomplished by equipment consisting of a Marion 191-M dragline with a 14-yd. bucket, two Marion 191-M shovels with 13-yd. dippers, a Marion 151-M dragline 8 yd. and a Manitowoc Model 4500 dragline 8 yd. This gave a total of 56 cu. yd. of dipper or bucket capacity loading into the wagons.

The 191-M machine normally handles a 10-yd. dragline bucket; the 14-yd. bucket was substituted, using a smaller boom, to make the most of the situation at hand. All of the Marion machines were electric powered, and the Manitowoc diesel powered.

The earth hauling was done with a fleet of thirty 50-ton Euclid end-dumps and twenty-five Euclid 28-yd. bottom dumps supported by nine Caterpillar motor graders and a fleet

of tractors. Supplementary equipment includes six, large water trucks, eighteen light towers each with eight 1500 watt bulbs, and servicing equipment.

Project manager for Western Contracting Corporation is Carl Collins. Oahe Dam is a project of the Corp of Engineers, part of the Lower Missouri control program directed by the Corps' Omaha district.

Radio phone network to aid N.C. road work

An extensive radio network has been completed in the four coastal highway divisions by the North Carolina state highway and public works commission. The facilities will serve for dispatching men and materials for road maintenance. And in event of a hurricane, the network will be at the disposal of the State Civil Defense for disaster aid.

According to commission Chairman A. H. Graham, the system began to show its value even before completion in recent months. It enabled engineers to conserve their time and expedite repair work with minimum travel. Money was saved on long distance telephone calls between central headquarters and the field offices.

The installation which has cost \$97,252 to date has been put in by General Electric Company. The facilities include a 60-watt station at each of the 14 cities in the area, and a 250-watt transmitting station at three locations. Also there are 100 mobile 60-watt transmitter-receiver units in high-

way cars and pick-ups in the four maintenance divisions.

The installation cost also includes 19 emergency Onan generator units, housed in some instances in small galvanized iron iron prefabricated shelters, as standby units in case of power failure.

Commission headquarters are in contact with this system through sets in the offices of chief highway engineer W. H. Rogers, Jr., and chief equipment engineer Ivan Hardesty.

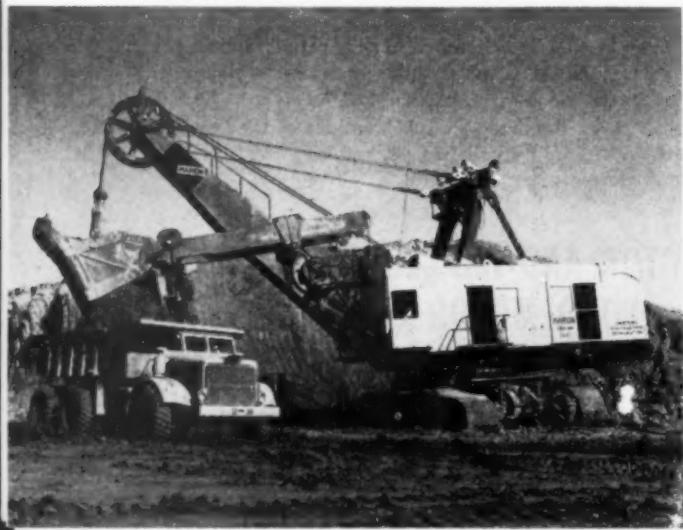
Cities not to pay for right-of-way

Governor Harriman announced that New York State cities having urban arterial projects designated as part of the Interstate Highway System would not have to contribute to the cost of acquiring rights-of-way for such projects.

"Ordinarily cities are required to contribute 50 per cent of the cost of right-of-way acquisition for urban arterial highways," the Governor said. "However, under the new law, the Federal Government undertakes to pay 90 per cent of the cost of Interstate highways, including the cost of right-of-way acquisition, and I am satisfied that, in accordance with the probable intent of the Congress and in order to expedite the program as much as possible, the State should pay the remaining 10 per cent. This will mean a saving to the cities affected of about \$15 million over a period of years."

- Marion 13-yd. shovel took only three bucketfulls to put a heaping load on the twin-engined "Euc".

- At work on Oahe Dam, a Euclid twin-engine rear-dump being loaded by a Manitowoc 4500 dragline with 8-yd. bucket.



How Airphoto Interpretation Can Speed Highway Planning and Design

By James G. Johnstone

Head of Engineering Geology and Soils Section, Geophoto Services

Representing a separate field from photogrammetry, photo interpretation techniques can tell the trained engineer many answers to questions of location, access planning, drainage design, soils, material availability and other problems.

A MUCH-DISCUSSED approach to the task of rapidly accelerating the Interstate highway program is that of making a more intensive and diversified application of air photographs. Certainly the use of airphotos to produce large-scale topographic maps by photogrammetric procedures will be greatly expanded. Modern photogrammetric techniques not only produce more accurate and complete topographic maps but produce them in a fraction of the time required by conventional field methods.

But there are even greater amounts of valuable information to be obtained through the use of airphotos beyond the photogrammetric techniques. This information is directly related to many phases of engineering a highway. The skillful acquisition and interpretation of this information constitutes the field of airphoto interpretation. While a certain amount of interpretation is necessary to produce a first-class topographic map, airphoto interpretation and photogrammetry in reality represent separate and diverse application of airphotos.

Much research has been undertaken in recent years to determine the practicability of qualitative and quantitative information which can be obtained from airphotos. This work has centered largely in various universities and has been sponsored by several branches of the armed services, state highway departments, and private funds. Despite the vast amount of information revealed and published on the subject, the leaders of many organizations,

public and private, which should have an interest in the practical aspects of this research are either poorly informed or fail to grasp the significance of its practical value.

In view of the new Federal highway program let us look at some of the practical ways that airphoto interpretation can be utilized to help overcome

some of the manpower problems which this new program will impose.

- *Airphoto Uses.* Following are but a few of the more important highway engineering uses to which airphoto interpretation can be applied either directly or indirectly:

(Continued on page 64)



• Figure 1. Detailed drainage marked directly on an airphoto. The watershed boundary of stream crossed by highway is shown by the broken white line.

The Euclid TC-12 gives you more work-ability than other Crawlers



The first really new tractor concept in years... with **ALL** the performance features you've wanted

Euclid's Model TC-12 Twin-Power Crawler establishes an entirely new standard of tractor performance. It's built to deliver unequalled drawbar horsepower, easy operation and a smooth, steady flow of power to meet any job requirement. It provides easy accessibility of all major components and all lubrication, check and adjustment points are located for maximum convenience. Unitized assemblies permit service or removal without a major tear-down of other parts.

Powered by two 194 h.p. engines at rated speed, 365 h.p. is delivered to the power

train. Each of the tracks is driven independently through separate Torqmatic Drives giving the TC-12 faster, easier steering and greater drawbar pull at higher speed. There's no clutch—shifting from one of the three speed ranges to another is done under full power —top speed in forward or reverse is 8.3 mph.

Have your Euclid dealer give you all the facts on the TC-12—compare with your present big tractor equipment and you'll know why so many owners have proved that **Euclids are your best investment.**

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE



Years Ahead in Performance on today's tough jobs!



Another job where the TC-12 proved its ability to get more work done faster—land clearing in Virginia. Excellent maneuverability in tight quarters, steady flow of power, and typical Euclid brute strength, make this Twin-Crawler a dependable top performer for this kind of big tractor work.



The TC-12 has no equal for pushloading large scrapers or pulling big earthmoving equipment. Each track is driven by a separate engine and Torqmatic Drive giving the Euclid tractor outstanding maneuverability. On their Indiana Turnpike contract, Union Builders kept the job ahead of schedule with a fleet of "Euc" scrapers pushloaded with the TC-12.

Compare the accessibility and performance of the TC-12 with your present big tractor equipment—your Euclid dealer has facts and figures from all kinds of jobs.



A. E. Dick Construction Co. is using 2 Twin-Power TC-12 "Eucs" for stripping overburden at a big open pit anthracite operation in Pennsylvania. Tremendous power and traction, unequalled in any other crawler, gives them more workability on tough jobs as well as on routine earthmoving work.



Equipped with a Tipdozer, this TC-12 proved a versatile machine on a big subdivision grading job. It pushloaded a fleet of big Euclid scrapers—getting heaped loads of 21 and more yards in a hurry—and did a lot of land leveling and clean up work itself.



Codell and Oman put their first TC-12 to work pushloading "Euc" Scrapers on a 3 million yard railroad job in Georgia. Independent track drive, good visibility for the operator and power matched to the job requirement enables the TC-12 to maintain maximum scraper production.



Easy operation of the TC-12—Torqmatic Drive eliminates master clutch and manual gear shifting—makes this "Euc" a high production machine. For a relocation project on U. S. Route 16 in Michigan, Sugden and Sivier used a cable controlled blade for dozing.

EUCLID DIVISION

... for more details circle 213, page 16

GENERAL MOTORS CORPORATION
Cleveland 17, Ohio



Airphoto Interpretation

(Continued from page 61)

1. Planning highway locations.
2. Access data for limited access facilities.
3. Prospecting for construction materials.
4. Planning subsurface boring programs.
5. Planning the design of bases and pavements.
6. Securing data to design openings for bridges and culverts.
7. Determining the cause of existing pavement failures.

It can be shown that for each of these items material savings in time and manpower can be realized by the technique of airphoto interpretation.

To produce this information, four types of maps can be prepared from airphotos. They are:

- A. Topographic maps
- B. Drainage maps
- C. Engineering-soil maps
- D. Land-use maps

On these four types, only the production of topographic maps requires intricate and expensive equipment. For the others the only equipment necessary are the photos, inexpensive stereoscopes, some form of a transfer device, and a well integrated knowledge of earth sciences, engineering, and photo recognition. Transfer devices are often unnecessary when the marked photos are laid in an uncontrolled or semi-controlled mosaic and rephotographed as a unit. The photo mosaic may then be used as a map even though it contains certain inherent inaccuracies not present in true maps.

The topographic map presents the configuration of the earth's surface by contour lines, together with additional limited cultural and hydrologic information. These are the most familiar maps to engineers. Their preparation from airphotos is a matter of general knowledge. Recently developed photogrammetric techniques make it possible to produce accurate large scale maps with contour intervals of 5 ft., 2 ft., or even 1 ft.

Drainage Maps

Drainage maps present a somewhat more detailed picture of the nature and configuration of watersheds and drainage systems. Although they utilize some type of base map for location purposes they are generally free from other types of information which would tend to confuse or clutter the map. However, they relate streams, their tributaries, and all other hydrologic features in great detail. As a re-



• Figure 2. A segment of an engineering-soils map prepared by airphoto interpretation. Soil profile data was obtained by sampling selected test sites located during the airphoto study.

sult, more accurate watershed boundaries are possible.

Through a cooperative program with Purdue University, the State of Indiana has nearly completed a series of highly detailed county-size drainage maps covering the state. These maps have been found useful for numerous engineering and conservation projects beyond the original intent as a highway department tool. Figure 1 illustrates the high degree of drainage detail which can be obtained by studying and marking airphotos.

• *The engineering-soils map* delineates the boundaries of soil types in the light of their engineering significance. The initial boundaries are based primarily on the landform-parent material concept. These are then regrouped and subdivided in terms of their engineering properties. Such maps can be prepared to any scale and degree of detail desired. Although they use a similar point of departure in preparation, the final map may take one of a number of forms depending upon the emphasis required. By limited and selective sampling and testing, the individual soil areas may be

keyed to one or more types of engineering tests, or placed in one of the classifications of engineering soils such as the Corps of Engineers Classification or the Highway Research Board Classification. In Figure 2 the legend has been keyed to the Highway Research Board method. Note also the dual nature of the legend which presents a 3-dimensional picture of the soil conditions. This was accomplished by selection of a minimum number of soil-test sites through use of the air photos.

• *The land-use map* classifies and delineates the influence of man on an area. Such units as forested, cultivated, recreational, industrial, residential, institutional, and commercial areas are outlined together with transportation

nets and other significant cultural data. The type of information and degree of detail will vary with the scale of

The engineering-soils maps become extremely useful in the problem of avoiding poor sub-grade conditions or in utilizing a more favorable location with respect to sources of aggregate and base material in terms of hauling time and expense. The drainage map can be used for location work in reducing the number of bridges and cul-

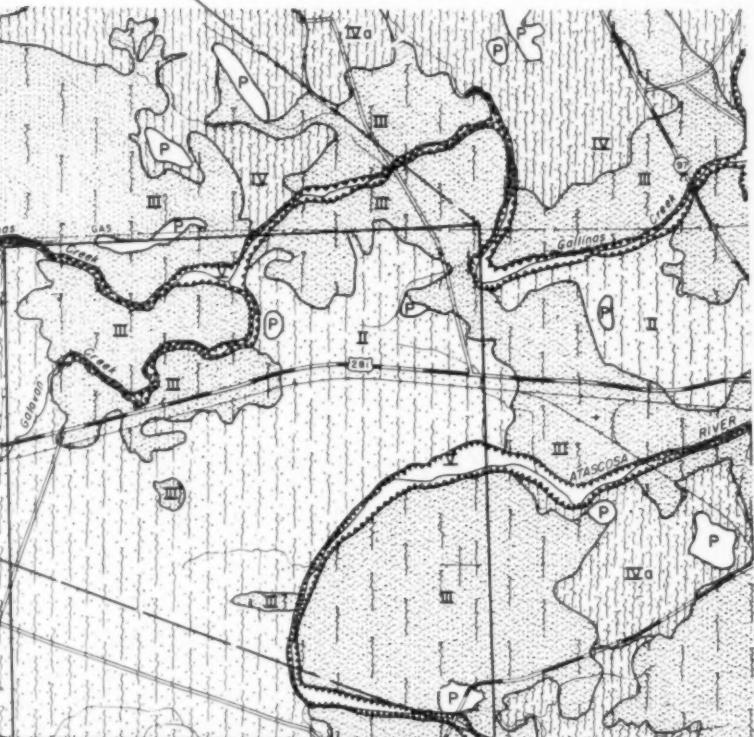
- *Materials of construction* such as sand, gravel and quarry rock for aggregate and base material have been in short supply in many areas of the country. With the big highway push more areas will face similar problems and the search for such materials will have to be greatly intensified. One of the most systematic approaches to this problem is through the use of engineering-soils maps or equivalent marked photo mosaics prepared by airphoto interpretation. This medium offers a rapid method for screening an area so that field work can be concentrated on those localities which offer some prospect. Not only are man-hours in the field reduced but those which are spent will be more productive.

- In planning subsurface boring programs along the proposed right-of-way the engineering soils map prepared from airphotos becomes a tool for further economy. It affords a means of locating exploratory boreholes at strategic points. Instead of the conventional uniformly spaced pattern of borings at intervals of 1,000, 500, 100, or 50 ft., the holes may be located with reference to the changes of soil units. In this manner and particularly where great similarity of soil pattern exists one or two borings within the limits of any one type of soil are sufficient to give all the information required. On the other hand, complex areas may require closer than normal spacing of boreholes in order not to miss certain less obvious differences. Such a planned boring program not only gives a more accurate picture of the subsurface but generally requires fewer holes at less expense.

If an airphoto study of an area includes a drainage map, the watershed above each proposed bridge and culvert can be accurately computed. By subdividing each watershed in terms of soil and terrain conditions it is possible to make a close estimate of the value of the coefficient of runoff for each part of the watershed. In weighted combination this important item of information necessary for use in standard runoff formulas is obtained. These formulas in turn are used to design the openings of bridges and culverts.

Land-Use Map

The land-use map is of special importance in the consideration of access data for limited access highways. Since farms are often cut in two, provision must be made for the owner to move equipment from one part to the other. The proximity and nature of supplemental routing of cut off farm roads can be more readily handled when the complete land use picture can be seen at once.

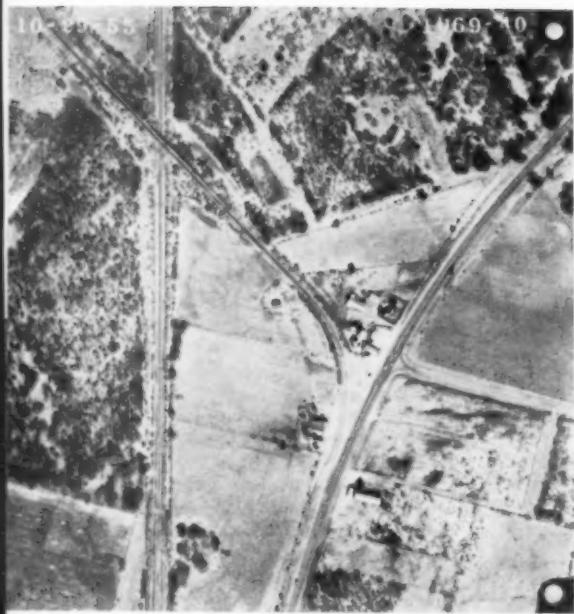


the photography and the purpose of the study. Figure 3 presents typical information gleaned from a single vertical airphoto. Notice that even the pole lines are marked. Had a need arisen, even the number of railroad ties and fence posts could have been determined.

By incorporating the data from one or more of these four types of maps, solutions to many highway engineering problems may be arrived at more efficiently and economically. The preparation of these maps from airphotos generally renders a more accurate and complete picture of the areal situation at less cost and in less time than by conventional field methods.

- With over 30,000 miles of new super highway to be located, many vexing problems will face the engineer. While the general topographic conditions of an area will control many miles of location, there will be other areas where alternate routes are possible.

- *Pavement Studies.* There are numerous examples which could be cited to illustrate the use of airphoto interpretation in determining the cause of existing pavement failures. The airphoto frequently supplies information regarding the environment of the area of pavement failure which can not be observed on the ground. Figure 4 is an interesting example of such a situation.



• Figure 3. A land-use sketch map, prepared from a single airphoto. (Photograph courtesy of Jack Ammann Photogrammetric Engineers, Inc.).

The relationship of the gullies to the site of the pavement failure was difficult to observe on the ground even after the airphotos disclosed the relationship. It is not coincidental that repeated failures occurred at this location. Airphotos not only disclosed the relationship but also gave additional evidence as to the probable cause. In this respect airphotos can not only be

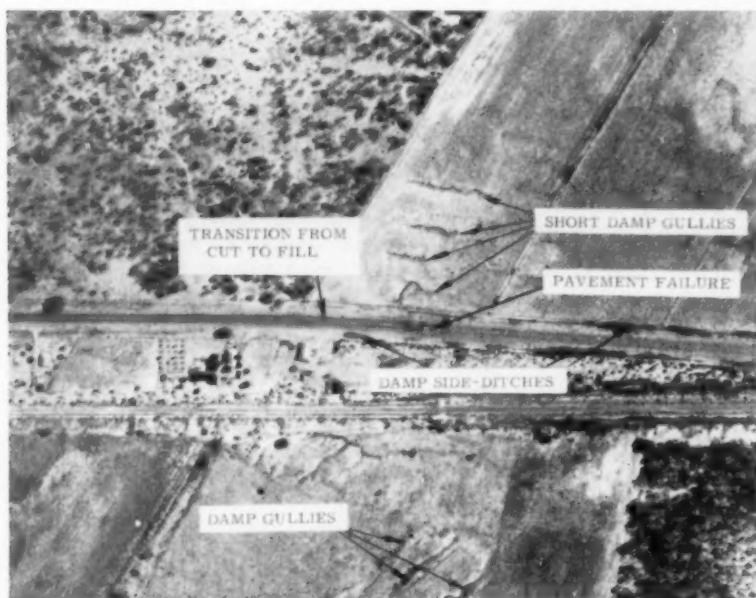
utilized to study existing problems but can also be adapted to anticipating problems with respect to new construction.

The use of airphoto interpretation as an accurate, rapid, efficient and economical tool in the preparation of drainage maps, engineering-soils maps, and land-use maps can not be matched by conventional field methods. These

maps are essential tools in the planning and design phases of highway engineering. Field, office, and laboratory work is thus substantially reduced or can be planned in advance so as to be directed toward more efficient and economical endeavor.

About the Author

Mr. Johnstone, who holds the degree of Geological Engineer from Colorado School of Mines, was an instructor of economic and engineering geology at Purdue University for four years, where he obtained an M. S. degree in soils and engineering materials. From 1952 to 1955 he was a research engineer in the Joint Highway Research Project at Purdue, with rank of assistant professor of highway engineering and engineering geology. In addition to his research work in airphoto interpretation, he has been a consultant on the Indiana East-West Toll Road, the Massachusetts Turnpike, and for Western Electric Co.



• Figure 4. Vertical airphoto which illustrates the relationship of environmental conditions to a pavement failure. (Photograph courtesy of Jack Ammann Photogrammetric Engineers, Inc.).

• The Labor Day week-end traffic throng was handled without a single fatality on the Ohio Turnpike, according to officials of that 236-mile road. Over 272,000 vehicles moved onto the highway during the period from late Wednesday night until midnight Monday.

During this period the turnpike commission reports a record toll collection of \$323,000 with \$77,000 on Monday alone, September 3.



Model 543. No machine or method can equal the low cost loading of this Barber-Greene loader. High travel speed, high capacity and finger tip discharge control save job time, man time, truck time.

Cut loading costs the continuous way

In a Massachusetts sand and gravel pit, a Barber-Greene Model 543 Bucket Loader handles 900 tons of $\frac{3}{4}$ " stone every day—easily tops all other methods in truck loading operations.

The 543 is ideal for the all-day-long loading operations of one truck after another because its continuous flow maintains maximum capacity re-

gardless of the skill or zeal of the operator.

Its simple operation makes it easy for drivers to load their own trucks. A hydraulically controlled swivel conveyor has the reach to load highest and longest trucks and trim the load to full capacity every time. And this versatile loader can be easily converted into a coal, snow or leaf loader.



Model 550 removes windrows in a hurry . . . with a capacity that keeps ahead of all trucks normally available. This light, highly maneuverable machine reduces windrow loading to lowest cost. Self-propelled at 10 m.p.h., with a turning radius of 8' 6".



Model 82A moves 1200 yards in 8 hours. That's the record of a Barber-Greene in a New York building and supply yard. Handles sand, stone, coal and other materials at high capacities. Easy operation permits driver to load his own truck.



Model 582 speeds topsoil stripping. Crawler mounted for sure footing on all soft bases, and equipped with a hydraulic swivel conveyor, the 582 is the fast, profitable way to load from stockpile, windrow or bank or to make light excavations.

56-38L

Write for literature on any loader in the Barber-Greene line



Barber-Greene

AURORA, ILLINOIS, U.S.A.



CONVEYORS... LOADERS... DITCHERS... ASPHALT PAVING EQUIPMENT
... for more details circle 188, page 16

FASTER COMPACTION at less cost!

COMPACTION ROLLER SAVES TIME, MONEY ON BIG EARTH-FILL DAM JOB IN ARIZONA

When Fredericksen & Kasler, contractors of Sacramento, Calif., were awarded a Corps of Engineers contract to build the new 9-mile Trilby Wash Detention Basin at Beardsley, Ariz., they used a Southwest 50-ton pneumatic roller to speed up operations and to cut compaction costs.

Construction of the big earth-fill structure—designed to protect nearby Luke Air Force Base from flash floods—started in July, 1955. When the job was finished a year later, about 3,000,000 cubic yards of yellowish-red clay, silt and light caliche had been moved.

Congestion Problem

Physical dimensions of the dams were so limited in cross-section that equipment congestion on the fill threatened to be a serious problem. The dam is only 100 feet wide at its base, 25 feet high, and tops out with a crest width of only 12 feet. The contractors had to move the dirt in fast because earthwork represented nearly 70% of the total contract. An added complication was that specifications required 95% Standard AASHO compaction and moisture at 100% of optimum.

Superiority Recognized

However, the specifications gave recognition to the superiority of the heavy pneumatic roller as a compaction tool. They provided that 12-inch lifts of dirt could be placed at optimum moisture and that either eight passes of a heavy-duty sheepsfoot or only four passes of a 50-ton pneumatic would be satisfactory.

The contractors used a Southwest C-50 for the principal reason that it would handle a normal daily input of 20,000 cubic yards (9 hours) without



Single Southwest C-50 Compaction Roller compacted 6-inch lifts in two passes to meet required 95% Standard AASHO density.

cluttering up the fill. As a speed-up measure the method of dumping was modified so that 6-inch lifts were placed, with the roller making two passes. Because of the full-oscillating feature of the four weight boxes on the C-50, the tires reach down and search out all the uncompacted spots.

Exceeds Required Densities

With 75% of the dirt work in, a life average for the project showed that average densities of 96.1 had been obtained. This was 1½ percentage points higher than had been required.

The C-50 was able to handle 20,000 cubic yards a day—and up to 30,000—without the use of auxiliary equipment for fill leveling. The contractors put the moisture content in the material in the borrow pit by sprinkler irrigation, followed by a week-long period of draining before loading and hauling in material.

Congestion Eliminated

Congestion was eliminated completely. The only compacting equipment on the fill besides the C-50 were two double sets of Southwest sheepsfoot rollers which did not serve in a primary capacity.

Sections 1,000 to 4,000 feet long were worked at one time. Even as the dam crested out at the top, no special concessions had to be given the C-50. It was able to travel just as fast as the hauling units which brought in the dirt. Elimination of the fill congestion problem put



Use of sheepsfoot roller was incidental to building Trilby Wash Detention Basin.



DW-21 towing Southwest C-50 Roller.



Southwest C-50 eliminated congestion problem by handling 20,000-30,000 cubic yards a day.

compaction out in front on a safe, profitable basis.

Southwest Heavy Duty Compaction Rollers can be teamed with all crawler type tractors and nearly all wheel type, off-the-highway tractors. Southwest Rollers range in size from 15 to 100 tons.

Write for complete information.

SOUTHWEST WELDING & MANUFACTURING CO.

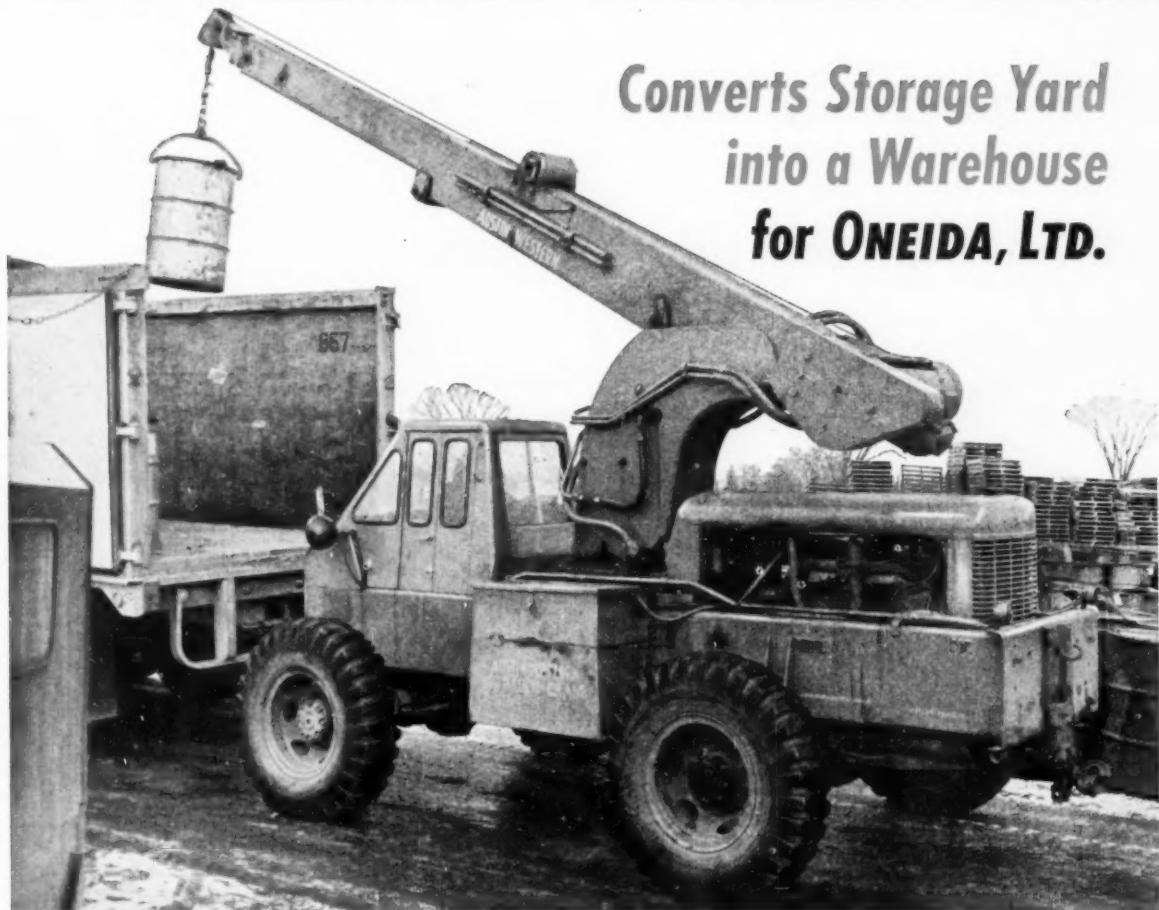
Construction Machinery Division

ALHAMBRA, CALIFORNIA

. . . for more details circle 249, page 16

ROADS AND STREETS, November, 1956

AUSTIN-WESTERN HYDRAULIC CRANE



Converts Storage Yard
into a Warehouse
for ONEIDA, LTD.

Versatile Crane Solves Storing—Warehousing—Handling Problems

Does Twice as Much Work with Less Effort

Here's what they say...

"Before we had our present complete unit, we used to skid heavy machinery half a mile down the road from the siding and into the plant where perhaps an overhead crane would place it. Now, the hydraulic boom of our Austin-Western crane handles any machine up to 5 tons in weight. It reaches in a freight car or skids a machine out onto the trailer and hauls it in short order into the plant aisle, very likely right to the point where it is to be set up, and lifts it into the place where it belongs."

"We have literally made a warehouse out of our storage yard with every location clearly marked and cases carefully piled in the places assigned to them."

"Hard to handle items, like telephone poles, are easy for our combination crane and trailer."

"Here in our main Plant a truckload of 12 drums, weighing from 1000 to 1800 pounds each, formerly caused heavy maintenance expense and downtime on our old truck and crane. Our Austin-Western equipment could handle twice this load with no trouble."

"The average for the last few months has shown more than 150 hours a month active service for our crane and trailer unit."

"A two-way radio in the crane cab and on each of our ten trucks enables the unit to save waste time, avoid doubling back and empty hauls."

For the complete Oneida Ltd. story, ask for Gould Certified Report No. 5511.



AUSTIN-WESTERN WORKS

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ROADS AND STREETS, November, 1956

Engineering: Key Problem

in Secondary Roads

Importance of employing qualified engineers and of helping step up their productivity was emphasized at County and Local Road Conference.

A record-sized delegation of more than 800 gathered at Mackinac Island September 17-19, on the occasion of the Fourth Annual National Highway Conference of County Engineers and Officials. The conference was held by the County and Local Division of the American Road Builders Association.

Speaker and panel discussion subjects ranged from low-cost roads to zoning, signing, drainage and small bridges. But the chief topic was engineering. At least six speakers, each in his special way, urged greater emphasis on good engineering and the speedy conversion of engineering techniques to make use of latest manpower-saving aids.

The federal-aid secondary road program has slipped behind, noted H. A. Radzikowski, chief, maintenance branch, Bureau of Public Roads. As of August 1, 1956, over \$372 million of unprogrammed federal-matching funds was piled up, waiting to be obligated to specific secondary projects. This is a four-fold increase in a single year, noted Radzikowski, who said that it points to the serious need of speeding engineering production on secondary projects.

Ways must be found, said this speaker, to utilize electronic aids and photogrammetric methods. While these methods are best suited to the large work loads of the state highway departments, they can readily be utilized to meet the smaller-scale needs of county and local road organizations. Uniting in groups and renting the necessary equipment are indicated answers. He called for greater cooperation between state and local agencies to work out the details.

Counties and local road commis-

sions totaling 246 have already made use of one dramatic saver of engineering and other personnel time, i.e., radiotelephone, noted Radzikowski. Among other suggestions: use of electrical resistivity methods for exploration to locate material deposits; pencilled construction drawings, reproduced photographically on tracing cloth; lump-sum bidding on jobs that lend themselves; standardization of design details for local road connectors required for interstate and primary projects.

• The importance of engineering in the federal-aid secondary road program was discussed by A. C. Leonard, chief, secondary roads branch, Bureau of Public Roads. The FAS program offers administrative machinery to bring nation-wide engineering experience to the aid of the local highway officials. It thus helps him demonstrate to his people the nature and value of engineering in local road operations.

Engineering Problem

Just how serious is the engineering problem, Leonard showed by some figures. In the expenditure of over \$1 billion annually on 2.3 million miles of of county and local roads (construction and maintenance), only 875,000 miles of these roads in 1,000 of the 2,700 counties and a scattering of the 14,000 townships have the benefit of regular technical direction. Too little of the vast available technical knowledge filters through into the local picture—a fact which represents a tremendous economic loss to taxpayers. Dissemination of this knowledge to county and local engineers and of-

ficials is the paramount problem, said Leonard. The evidence, he said, definitely links the county engineer, or the lack of one, with the corresponding success or failure of the FAS program to operate satisfactorily in the various counties.

In a talk on "Advance Engineering Methods", George M. Foster, chief deputy commissioner, Michigan state highway department, told of the engineer shortage and of Michigan's recruitment program for professional and non-technical personnel. He also outlined Michigan's plans and progress in the adoption of latest aerial and other labor-saving techniques.

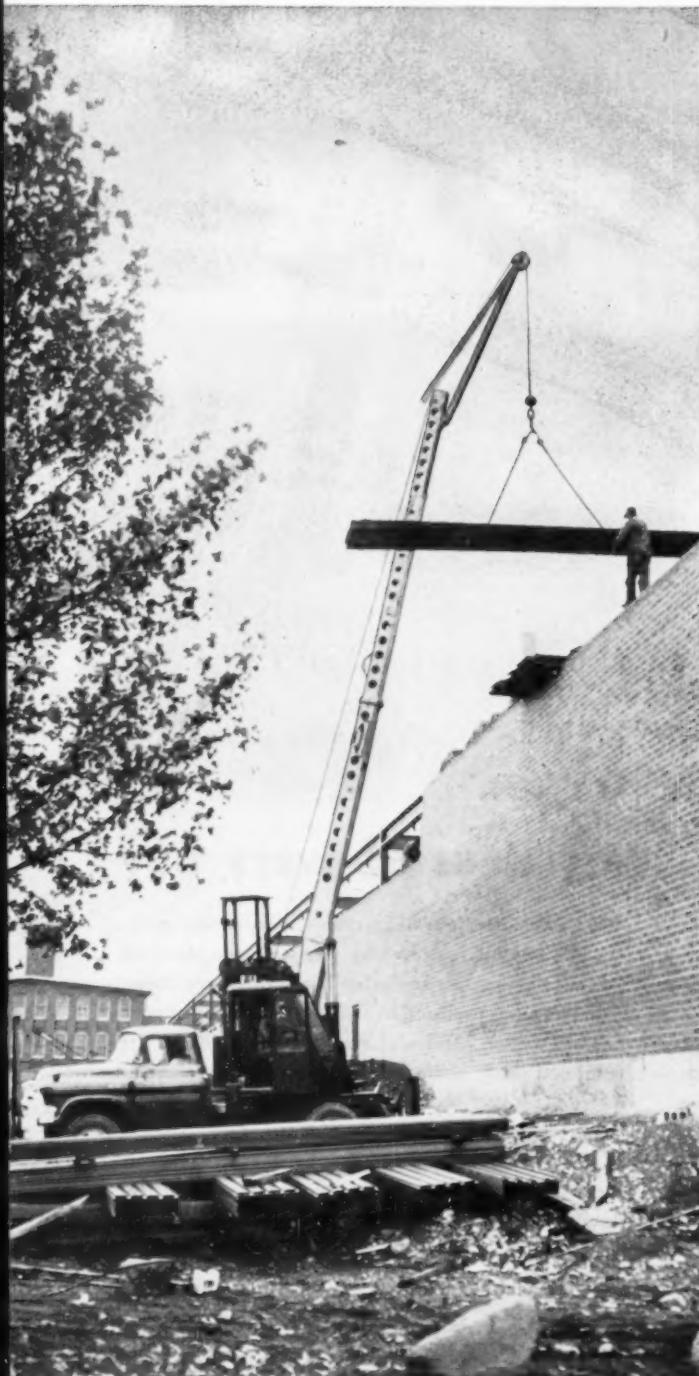
"*Making Highway Engineering More Productive*" was the similar subject covered by Harold L. Plummer, chairman, Wisconsin state highway commission. Particularly because of the long-time highway financing given us by Congress, the challenge to county as well as state and city officials is to replace piecemeal effort with long-range planning. Administrative leadership is the key to any success that may be achieved, in training personnel and building up better organization efficiency. He cited effort in Wisconsin, during the past three years, in which time the same number of engineers have found ways to handle 2½ times the engineering volume.

- "Counties and states which continue with 1948 methods can get along unchanged for about one more year—then, bang!", warned Plummer. "The program will collapse and heads will roll, as the highway program is further expanded."

The state's role, said this speaker, must be to establish an active secondary road section, whose job is not only to screen FAS projects but also give consultation and technical service to the counties when needed. Mechanism for such cooperation should be provided by a representative board of county road officials which will advise on such matters as fund allocation, checking of cooperative projects for approval, and other mutual problems. "Control of county roads at the county level—an important and desirable thing—is best assured in the long run if county officials develop and maintain good leadership," was the gist of Plummer's closing advice.

Plummer concluded by pleading for more planning studies and research of all kinds in behalf of county and local roads, such as is now being performed as the basis for planning state and federal highways. The county engineer needs to be better armed with such basic data, obtainable only through research projects devised in his particular behalf.

Bucyrus-Erie Announces New 5-Ton Model H-3 Hydrocrane 10,000-lb. maximum capacity, 3/8-yd. clamshell



Bucyrus-Erie Hydrocranes have long been noted for big lifting capacity per pound of crane weight. Now the new Model H-3 Hydrocrane—mounted on a lightweight, low-cost truck—gives you 10,000-lb. maximum lifting capacity. And the new Model H-3 retains short tail swing characteristics that have made Hydrocranes standouts on close-quarter work.

In addition, this all-hydraulic, multi-job speedster has many more outstanding new features that put it even farther ahead of ordinary truck cranes.

NEW LOAD INDICATOR WEIGHS EACH LOAD YOU LIFT

A new outstanding safety feature is the load indicator and pressure gauge located at the operator's station. He knows at a glance if the load can be safely lifted at the required radius.

AUTOMATIC OUTRIGGER LEG LOCKS ELIMINATE DOWN DRIFT

Vertical outrigger legs have spring-actuated catches which operate automatically to eliminate outrigger down drift during travel. No chains or snap hooks are needed.

NEW HOUR METER CLOCKS ENGINE WORK HOURS

Better care results from the recording of actual hours of operation . . . makes it easy for the service man to follow recommended protective maintenance program.

NEW IMPROVED THROTTLE CONTROL FOR SMOOTHER OPERATION

Vibration-proof locking throttle control, conveniently located at operator's finger-tips, permits him to set and hold engine at desired speed.

NEW TRUCK BRAKE LOCK

"Mico" electric brake lock holds truck wheels firmly in place while the crane is working.

And this is just the beginning. The new H-3 Hydrocrane has dozens of other new features that will speed your jobs—help you make more money. Get in touch with your Bucyrus-Erie distributor for the full story.

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SOUTH MILWAUKEE, WISCONSIN

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ROADS AND STREETS, November, 1956



The Unit You Will Use Every Hour of Every Day

There is more flexibility in a Ford tractor with a Sherman back-hoe and loader than in any other equipment on the construction site today. You'll use it on more different applications than anything else you own. Trenching for footings, service lines, sewers and drains—digging holes for tanks and catch basins—loading aggregates, levelling, back filling and light stripping—carrying materials and supplies, cleaning up and distributing loose materials—and dozens of other jobs. It's an inexpensive machine you can easily afford for the many odd construction

or maintenance jobs that crop up so consistently.

The two big reasons why you see more Sherman Power Diggers than any other kind are simply these: You get more production from a Sherman and your Ford Tractor Dealer, having sold so many, is equipped and skilled in helping to keep your machine on the job working at peak output without costly downtime.

Now is the time to see your Ford Tractor Dealer for a demonstration of this dependable, high production back-hoe; or, write for Bulletin No. 3543.

See the Sherman
Power Digger soon
at your local
FORD TRACTOR DEALER



*Designed, Engineered and
Manufactured jointly by
Sherman Products, Inc.,
Royal Oak, Michigan.
Wain-Roy Corporation,
Hubbardston, Mass.

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... for more details circle 247, page 16

ROADS AND STREETS, November, 1956



- The upper line in this chart shows what would have happened to cost per yard costs if there had been no equipment or labor productivity improvement since 1923. The lower line shows the actual average bid price index.

Comments on the occasion of the first anniversary of the launching of the D9 tractor.

By Doyle Reynolds

Supervisor, Sales Development, Caterpillar Tractor Co.

WITH the introduction of each new and larger tractor, the successful contractor, in his vigorous pursuit of those few extra elusive percentage points of profit, has asked himself where are the dividends in the big tractor? What do I receive

in return for my greater investment? Will it match my present spread? Are my jobs big enough to fully utilize the largest tractor?

With these questions firmly fixed in his mind and being the rugged individualist he is, the average con-

tractor in this highly competitive industry would probably follow a course of investigation that would cause him to draw the following conclusions.

In his investigation he would find – if he wasn't already aware of it – that the national average price of common excavation has varied little from the normal of about 36c. During this period, labor costs have soared almost 250%, while his equipment costs have doubled. Caught between low contract prices and the constantly increasing cost of machines, the contractor turns to increased labor production as the most ready avenue for finding increased dividends. Thus, the logical approach is to increase the productivity of both men and machines; and herein lies the soundness of utilizing the largest machine available.

This same line of thinking prompted our original investigation as to the feasibility of a big tractor. True, there is a never-ending trend towards increasing the horsepower of present units to the limit of their mechanical components.

However, we were interested in knowing if there was a need for a *really big* new tractor. Would the increased investment in a larger tractor result in increased profits for the user?

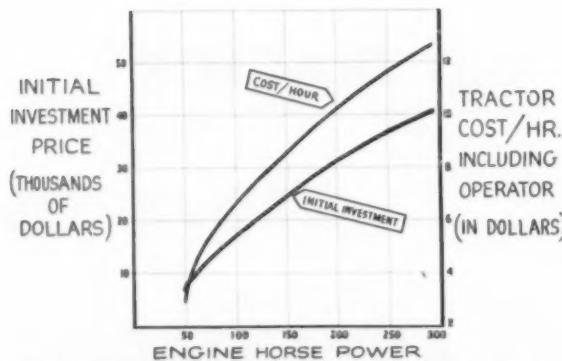
Our belief in the real need for such a unit resulted in the introduction of the D9, which is about 30% larger and 40% more productive than any previous tractor.

Although the owning and operating costs increases as HP increases, the

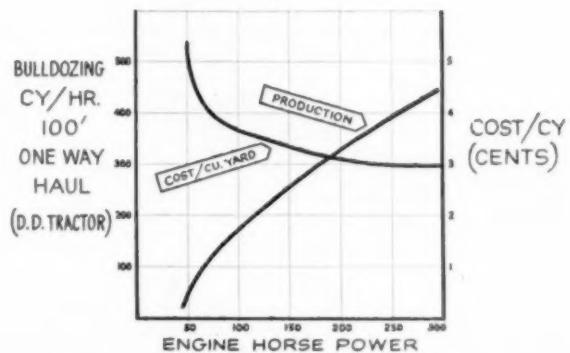
BIG TRACTOR

PROVES ITS ADVANTAGES

Year	Const. Wages Skilled (ENR)	Tractor Horsepower	HP/Wages
1935	\$1.09	95	.87
1936	1.15	96	.84
1937	1.32	96	.73
1938	1.41	96	.68
1939	1.44	96	.67
1940	1.47	96	.65
1941	1.50	113	.75
1942	1.56	113	.72
1943	1.62	113	.70
1944	1.63	113	.69
1945	1.66	113	.68
1946	1.80	113	.63
1947	2.02	113	.56
1948	2.25	130	.58
1949	2.41	130	.54
1950	2.52	130	.52
1951	2.67	130	.49
1952	2.84	130	.46
1953	3.01	130	.43
1954	3.14	150	.48
1955	3.25	230	.71
1956	3.30	230	.70



- Horsepower increases have lowered cost per yard. The contractor is vitally interested in this final figure by which his managerial talents and profits are judged.



- Increasing the productivity of labor by making available more powerful and efficient machines is a partial solution of the contractors' problem. This chart shows the effect of horsepower increase on investment and cost per hours.

cost of the operator remains the same regardless of machine size. The tractor user pays no direct penalty to labor for making more power available to the operator.

He has, however, reduced the percentage paid to labor and, if greater production results, he is in effect minimizing the cost of labor.

Historically, this same thing has been going on over the past thirty years, as shown in the accompanying table.

Power, as such, is worthless unless applied. To increase the productivity of labor it must be applied efficiently, consistently and with least effort on the part of the operator.

The operator may cost $2\frac{1}{2}$ times as much as he did in 1926, but his fatigue rate remains the same. The contractor is well aware that such innovations as power steering, power brakes, increased visibility, more comfortable seats, all have been included not to "spoil" the operator, but to

enable him to utilize the maximum power for the machines for longer periods of time.

In addition to lessening the effort required to operate the tractor, it stands to reason that the attachments should require a minimum of effort to use. Two excellent examples of this are the commercially available tractor mounted ripper and the hydraulically tilted bulldozer blade. The use of the tractor mounted ripper rather than the towed-type ripper adds to the maneuverability of the tractor. In many instances, the push tractor can now assume the dual duties of ripping and pushing where formerly both jobs had to be accomplished by two separate tractors. With the hydraulically tilted blade the operator no longer has to climb down from the machine and waste considerable time tilting the blade — a flick of a lever does it for him.

• *Factor of Price.* At this point, however, the contractor glances at the

price tag on the machine and he is reminded of one of his original queries, "What do I receive in return for my greater investment?"

The final and most important answer the contractor wants rests inevitably with the end result — production per hour and cost per year. Bids today are narrower — below engineer estimates an uncomfortable number of times — and he is vitally interested in that final figure by which his managerial talents and profits are judged: costs per yard. Increasing labor productivity through more powerful equipment is a partial solution.

There is a second reason for the trend to larger equipment, changing job conditions.

There has been vast increases in the physical characteristics of highway projects and of all types of construction work, whether it be pipelines, dams, new mines, or expansion of the old. This has also produced new demands on the user's equipment and has been reflected in the maintenance cost with its attendant loss in availability of the heretofore standard size machine. Unlike the smaller machines, the big tractor with its greater capacity is less likely to be working near its fatigue points.

Completion deadlines have been moved up, making another reason for the trend to larger equipment. And present high overhead costs can be minimized by getting off the job sooner — and on to the next — through the use of more productive equipment.

The trend towards larger, more powerful equipment is not peculiar to the earthmoving industry alone. It is but part of an industrial effort in every field to find more ways to increase labor productivity, which has contributed to the highest standard of living in the world and what we call the "American Way of Life."

Self-propelled Scrapers Buck Snow Drifts

- In northern states this winter: Self-propelled scrapers can help buck snow drifts, as shown by this picture of a LeTourneau-Westinghouse D Tournapull in action. County-owned as well as contractor-owned earthmoving equipment is often available to help in winter emergencies.



"Here's why we're swinging to

FORD INDUSTRIAL POWER . . .

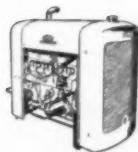


We get immediate delivery on most Ford replacement parts and quick, on-the-spot service 24 hours a day. One mixer out of action for a day can cost us close to \$200. With Ford-powered equipment, there's little danger of this happening, for our Ford Dealer is nearby, ready to help us out when we need it."

—MR. E. M. METZEN, Pres.
E. B. Metzen Co.,
Center Line, Michigan



Again, Ford is first choice where service counts



Metzen—one of the largest Transit Mix Companies in the Midwest—has the plant capacity to turn out 125 to 150 yards of transit mix an hour.

Twenty-eight trucks make up the Metzen fleet—ten more are leased during peak periods.

"King Size" is the word for this operation! And to keep production flowing smoothly, Metzen has just added three more Ford-powered Challenge *Pacemaker* 6-yard truck mixers to its fleet. The *Pacemaker*—powered by a Ford "223" Heavy Duty Industrial Engine—is capable of charging at the rate of seven seconds per yard and takes a back seat to *nobody* in discharging low slump concrete.

Couldn't you improve your operation with Ford-

powered equipment? Ford offers you a full line of 4-, 6- and 8-cylinder engines to choose from. Every engine gives you modern, overhead-valve construction. And every engine, except the new super-efficient "220" Diesel, can be easily adapted for use with either butane-propane or natural gas.

And, as the Metzen Company did, you'll find that Ford can serve you better. For a network of newly-appointed Ford Industrial Products Dealers has been set up across the country. Now there's a Ford Industrial Power Headquarters right in your own area.



INDUSTRIAL ENGINES
AND POWER UNITS

● Write for complete information: INDUSTRIAL ENGINE DEPARTMENT

FORD Division of FORD MOTOR COMPANY, P.O. BOX 598, DEARBORN, MICHIGAN

... for more details circle 206, page 16

ROADS AND STREETS, November, 1956

Remember this?

By the 1920's, earthmoving was becoming more and more mechanized, but the mule teams and wagons were still a big part of the production team. This early elevating grader pulled by a "modern" tractor was the fastest dirt digger of the period.



How Would You Bid a 7,800-Mule Job?

Today's typical mechanized roadbuilding fleet does the work of hordes of mules and over 7,000 men using 1922-model equipment—with 1/80th the man-hours and at 1/4 the real cost to the public. The 1957 ARBA Road Show will reveal again the tremendous strides made in equipment productivity.

MOST exciting industry event in nearly a decade is the ARBA Road Show, to open January 28 and run for five days in the Chicago International Amphitheatre. Some 250 manufacturers will present to visitors a wide variety of all the tools known to construction. It's been nine years since the last Road Show. The Show was a more frequent affair in the years from 1909 to the War II, but this is the greatest. The 1957 exposition is sure to be a revelation of the tremendous strides made in equipment productivity in that time. Highway and street maintenance equipment will also be included.

Manufacturers are currently putting the finishing touches on the new models to be unveiled. Some entirely new devices will be demonstrated for the first time at the exhibit.

The Amphitheatre, the scene of the Democratic Convention, and twice as large as any other exhibit hall in the United States is getting a 410 x 270 ft. addition for the Show.

• Coming as it does, at the outset of the National Highway Program, the

1957 Road Show focuses attention again on the role of equipment in roadbuilding economics. No other factor has had more influence in keeping construction costs in line and placing safe, modern highways within reach of the American taxpayers. In earthmoving, particularly, this is true. But the Road Show will spotlight how fast and how far equipment has brought complete mechanization of the highway construction process.

Typical Road Job

Only 25 or 30 years ago, the typical road job was a scene of men and mules; the only common power equipment was steam shovels and steam rollers. Think what a 1922-type "spread" would have to consist of to make 1957 production speed!

L. J. Missimer, a Virginia state highway engineer for many years, recently compared the general organization of an earthmoving job in 1922 with the same hypothetical job today.

"Let us imagine a good-sized grading job in 1954 being done with the

Road Show to Dramatize

type of equipment in use in 1922. Assume a project involving 500,000 cu. yd. of excavation with average haul of 1,500 ft., estimated at 15% rock and with 50,000 tons of stone for surfacing. Further assume that the contractor schedules production at 4,000 cu. yd. per day to meet completion date and that during the period of loose stone surfacing, crushed stone would be useful at the rate of 1,000 tons per day.

"In 1954, the basic earthmoving tools for such a project would be about as follows:

- SCRAPER SPREAD—four 15 yd. pneumatic-tired self-propelled scrapers, one pusher tractor, three large bulldozers, two motor graders, two tractors with tamping rollers.

- SHOVEL SPREAD—one 2-yd. shovel, three 15 or 20 ton diesel trucks, two 600 cfm diesel compressors, four wagon drills, two large bulldozers, one motor grader.

- MACADAM SPREAD—twenty trucks, two motor graders, one stone spreader, two 10 ton rollers.

- CRUSHING AND QUARRYING—two 600 cfm diesel compressors, three wagon drills, two jackhammers, three 15 ton diesel trucks, one bulldozer, one 2-yd. shovel, one ½-yd. shovel, one diesel powered crushing plant.

"The total number of men engaged



1956 Models

This modern loader, pushed from behind by a powerful tractor, piles 15 yards into a bottom-dump wagon in 25 seconds. Contractors will see hundreds of pieces of equipment like this at the upcoming ARBA Road Show in Chicago next January 28 to February 2.

Our Equipment Progress

on such a project, including foreman, laborers, truck drivers, mechanics and miscellaneous would approximate 75.

"Now let's consider undertaking the same project on the same time schedule using 1922 methods and equipment.

"In place of the four 15-yd. self-powered scrapers, substitute 2,000 mules. Add on an additional 800 mules for plow teams and snatch teams, 60-80 mules with graders and already we have gotten up to about 3,000 mules and 1,500 teamsters, without considering the extra men required to feed and take care of both men and mules.

• "Following along with the same general reasoning—and without bothering you with the arithmetic of the conversions involved—the project would possibly require about the following totals of equipment and manpower:

Mules	7,800
Men	7,200
Scrapers	1,000
Plows	35
Steam engines and rollers	70
Rock crushers	20
Road graders	50
Carts and wagons.....	1,000
Handwheel shovels	20

"By a few rough calculations it can be estimated that this hypothetical

job—assuming all these men and mules could be crowded on the job—would have required direct expenditure of 8,640,000 man-hours in 1922, whereas today it would require only about 110,000 man-hours."

What about costs? Mr. Missimer made some comparisons on that score, too.

Equipment Revolution

"What influence has this equipment revolution had on the taxpaying public, who support this continuing construction program? Making due allowance for the inflation of the dollar since 1922, it seems fair to state that an excavation price of, say, 40¢ per cubic yard today would have been comparable to a price of 13¢ per cubic yard in 1922. As any of you know who are conversant with grading prices in 1922, earth excavation with, say, a 2,000 ft. free haul would have probably brought a price more like 60-75¢—so it is apparent that the cost to the public in terms of real value has been reduced to about one-fourth of the 1922 figure. And certainly it is this reduction in true unit costs that has made possible this tremendous increase in construction work which we have seen and are witnessing every day with construction for new superhighways frequently averaging 1,000,000 cubic yards

per-mile, whereas in 1922, 20,000 cu. yd. per-mile was considered heavy grading."

And he concludes: "Summing up, construction needs of today could never have been met without the concurrent development of modern equipment. It is safe to say that the far heavier demands of tomorrow will require continued equipment improvements, which will shortly render our present day roadbuilding machines as obsolete as late year's bird nests."

1956 highway spending will top \$8 billion

The figure \$8.2 billion is set by the Bureau of Public Roads as the probable gross expenditures for highway and street work in the United States during the 1956 calendar year.

This sum includes only slightly the influence of the new Federal highway program, since funds from the 1956 Highway Act began to be available only at mid-year.

The Bureau's breakdown of expenditures: \$5.5 billion for construction, \$1.9 billion for maintenance, \$0.3 billion for administration, \$0.33 billion interest on loans and bonds, and \$0.1 billion on policing.

The total which is an increase of \$800 million over 1955 includes \$1.1 billion in Federal funds, the first time that the Federal share has passed the billion mark.

The nation's total debt for highways is expected to reach \$11.4 billion by the end of 1956, a rise of \$1.7 billion in the year interval.

Can you afford to use big production scrapers for your handyman jobs?

Check the dollars you lose in using a 12-yard scraper to do small-yardage odd-jobs that can be done in same (or less) time with a 9-yard scraper

Some contractors figure, since cost of the operator is the same, they can do handyman clean-up jobs economically with production scrapers. Check your own cost figures and make an actual dollar comparison of these extra expense items. Use your own job costs and see how much it actually costs to use big scrapers on small scraper jobs.

Extra equipment cost . . .	\$.....
depreciation, interest, insurance, etc.	\$.....
Approx. extra operating cost, based on extra horsepower and weight . . . fuel, lube, service . . .	\$.....
Approx. extra maintenance cost . . .	\$.....
tires, repairs, etc.	\$.....
Lost pay-yard production while on odd-job service . . . yards per hour . . .	\$.....

Every "big" dirtmoving job breaks down into work sections . . . some suitable for "big" equipment . . . some suitable for "small" equipment.

A handyman scraper (like the improved D Tournapull) fills the need for a fast, flexible, self-propelled dirtmover which works economically on both big and small-yardage jobs on long and short hauls.

It can handle pioneer dirtmoving before the rest of your equipment moves in. It can build, gravel and maintain good haul-roads to speed your production dirtmoving. It can develop drainage systems for your

water-trapped cuts and fills so that you can work one or more spreads through shut-down weather. It can handle short and shallow cuts, where your big scrapers wouldn't get a full load on a one-run pass. It can do the ditch excavation needed along your shallow-grade cuts.

It can follow production fleets to fine-grade between forms, build access roads and driveways, finish shoulders, spread gravel and top-soil, haul in selected grade material, haul and spread topsoil over median ditches, slopes and shoulders, and

perform dozens of other odd jobs like those shown here. By handling these "headache" jobs on a high-speed, economy basis, the handyman scraper cuts delays and expenses that eat into your profits.

When it runs out of odd-job service assignments, the handyman scraper fills in well with any combination of push-loaded production equipment. With pay-load capacity of around 7 pay yards, these small size scrapers produce worthwhile yardage. Their easy loading and dumping characteristics, quick maneuverability, plus speeds to 29.5 mph, enable these smaller rigs to often equal, and sometimes out-perform, your big capacity, but bulky and slower-moving, crawler-and-scraper combinations. While the D-size rigs can't equal cost-per-yard of the big 12 to 18-yard rigs on production earthmoving, they will pay their way on production in spare time between "handyman" earthmoving assignments.

On weekends, off-hours, or between more pressing assignments, these handyman scrapers can also give you extra profits by doing small hourly-rate or by-the-job contract work for neighboring farmers and businessmen. They are also the No. 1 tool on subdivision, airport, and other grading contracts for scattered, light-cut work requiring speed, agility and close clearances.

Backfill foundations



Load blacktop



Spread gravel





NEW...improved D Tournapull now has increased capacity of 7.3 yards struck, 9 yards heaped. Overall width is reduced to 8', with axle-load well within 9-ton limit, to allow roading without permit. More than 3000 "D's" are in service all over the world.



Handyman Scrapers . . . what abilities should you look for?

1. Roadability via highway without permit is a "must" to facilitate fast, quick moves anywhere, anytime. This calls for meeting BOTH 8' width limitation and 9-ton axle-weight limit.

2. Look for ability to get heaping *push* loads in average dirt, under favorable conditions, in 45 seconds or less loading time. Scrapers should self-load to 60% of heaped capacity in 1 to 1½ minutes in dirt of light to medium density.

3. Be sure you can handle capacity loads without overloading clutch, transmission and tires.

4. You need high maneuverability, easy steer, ability to make 90° turns. You also need ability to steer and spread simultaneously on slopes.

5. Frequently working alone, your "handyman" must be able to

pull out of mud holes or soft spots without assistance.

6. These utility scrapers should be able to fill against foundation walls, piers, alongside new pavement. They must be easy to steer accurately, able to make short turns, able to spread close against side obstructions.

7. Since you will need them on clean-up for finished grade, you need accurate blade control. Wheels should be inside cutting edge.

8. Because travel on new paving is often involved, minimum weight, and use of tires at minimum inflation are important. This will permit operation over new slab, curbs, sidewalks. Minimum weight and inflation are also important on finishing operations to prevent rutting of finished grades before final surfacing.

9. Since all rubber-tired machines in this class operate with approximately the same ratings of engine power, clutch, transmission and tires, high machine weight and bowl capacity should be checked against probability of expensive maintenance, excessive downtime and short tire-life.

10. Initial cost is a major item on machines largely involved in non-revenue dirtmoving. In your production fleet, you want the largest scraper that the one-man operator can keep busy, considering depth and length of your cuts. Extra initial cost here, pro-rated on a per-hour basis, is easily recovered in extra yards moved per hour. But, on the "handyman" service, mobility, speed, accuracy and agility are the pay-off factors. Much of your load and spread in this type service involves light cuts and short loading runs. Extra investment in maximum bowl capacity, and heavy construction to carry it, can't pay off against slow-downs in speed and increased maintenance costs on the part-time production-fleet application where you *might* benefit.

11. Remember, you are buying these 138 "horses" primarily for speed and mobility type applications. Every unnecessary pound of machinery and extra load-carrying capacity reduces their ability to "run". It is obvious that, when a tool is engineered for two opposing types of application, it must compromise in both directions. That means you lose efficiency wherever you use it.

12. Check experience, of course. The handyman scraper that has wide use and experience under all the varied conditions of world-wide service is likely to give you most efficient service, minimum downtime, and most profitable performance.

See next page for additional information on the handyman problem ▶

Blade shoulders



Mine topsoil



**Your handyman scrapers
do all these jobs faster,
easier, and at lower cost**

Grade access roads	Load blacktop
Backfill foundations	Backfill culverts
Mine topsoil	Blade shoulders
Grade driveways	Cut drainage ditches
Shape backslopes	Spread gravel
Strip overburden	Spread topsoil
Load stones, stumps	Fill-in on production
Haul sand	Spread select material
Fine-grade for paving	Finish-grade medians
Fill hoppers	Push-load and doze

**More about
"Handyman" Scrapers**



**Check this roadable "D"
with capacity to 9 yards**

Improved to meet your request for reduced width of roading without bothersome permits, the handyman D 'Pull can increase your profits on your small-yardage production assignment. It can also cut costs on pioneering and clean-up, maintain haul-roads and drainage to speed production dirtmovers, cut lost time for heavy production equipment by handling emergency assignments.

New capacities are 7.3 yards struck and 9 yards heaped.

Overall width has been reduced to 8', so that it now can be roaded anytime without permit on highways requiring 8' maximum clearance. Axle-loads are well under the 9-ton roading limit.

Other improvements include a new tailgate which eliminates "fall-over" of material. Higher apron lift gives easier ejection of sticky or bulky material. Operator has better load visibility. Many other improvements have been built into the "D" over the past 9 years, as a result of experience with over 3000 "D's" working in all parts of the world.

Speeds to 29.5 mph on rubber, allow it to travel anywhere . . . work faster . . . move more earth in less time than bigger tractor-scaper combinations costing thousands of dollars more than the "D".

It loads itself or can be push-loaded. It hauls earth and other materials a hundred feet or several miles economically. Optional 8' dozer blade handles miscellaneous dozing jobs.

Here are some of the ways D Tournapull can make your investment dollars go farther:

1. Handles wide variety of jobs

Do-it-all "D" does pioneering, ditching, rough-grading, backslipping, spreads gravel and topsoil, speeds through dozens of other clean-up or small-yardage production jobs. Its easy mobility and maneuverability (90° turn)

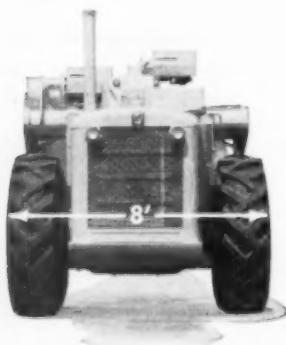
make it ideal for subdivision grading, landscaping, and for building driveways, streets and alleys. Versatility makes "D" economical on many kinds of work now done with crawlers, bigger units, or several special tools. It does big jobs or little jobs . . . reduces headaches and delays . . . earns extra profits by doing sideline work by day or hourly rates in spare time.

2. Works alone or in fleets

Tournapull self-loads, hauls, and spreads . . . can handle the complete earthmoving operation. The "D's" can push-load one another in fleet operation . . . or they can be push-loaded by any tractor or motor grader. "D" can also work profitably along with bigger scrapers in your heavy earthmoving production fleets.

3. Travels fast around the job, between jobs

You don't need a permit or a truck-and-trailer to haul D Tournapull to its assignments on your job. There are no loading and unloading delays. Mobility allows "D" to reach any assignment on the largest project in just a few minutes. 5 miles is less than 15 minutes away. Also





the improved D Tournapull, meeting 8' roading clearance and 9-ton axle-load limit can "run" anytime from job-to-job via highway, city streets, or cross-country at speeds to 29.5 mph.

4. Outproduces crawlers

Three to four times faster speeds allow "D" to match and often outwork crawler-scaper teams costing 20 to 40% more than D Tournapull. With precision push-button control, "D" does finishing work faster, easier.

5. Works in soft going

Exclusive Tournapull differential transfers power automatically to gripping drive-wheel when other wheel starts to slip. You get better traction in muck, sand, soft material throughout haul cycle for dependable performance under toughest job conditions.

6. Turns in less space

Compact design, power-steer through geared king-pin, full 90° turn, enable "D" to work in restricted quarters and on narrow fills. Jack-knifing is eliminated. 2-wheel prime-mover concentrates weight on drive wheels for better traction in slippery footing.

7. Lowers maintenance costs

Replacing the 450 to 500 moving track parts of crawlers with Tournapull's 4 rubber-tired wheels

naturally reduces your repair costs. Power travels all the way on enclosed anti-friction bearings, always lubricated, always sealed from dirt. There is less friction, less wear, less lubrication cost.

8. Less weather delay

Big, low-pressure, 18.00 x 25 tires give good traction in soft going. Exclusive power-transfer differential and 90° turn, geared king-pin power-steer allow "D" to "walk" out of trouble. Tournapull works where other rubber-tired earthmovers stall. It's a handyman that's ready to clean-up the odds and ends of tough going that hold up big production tools. On many jobs a "D" can pay for its entire cost in a single season by just maintaining good drainage and fast haul-roads.

9. Safe and easy for operator

Big disc-type air-brakes on 4 wheels (2,822 sq. in. braking surface), power-steer, simple trouble-free finger-tip electric controls, low-pressure shock-absorbing tires, bucket-type safety seat . . . all make busy work-days easy for operator. "D" safely travels steep grades, narrow fills, in close clear-

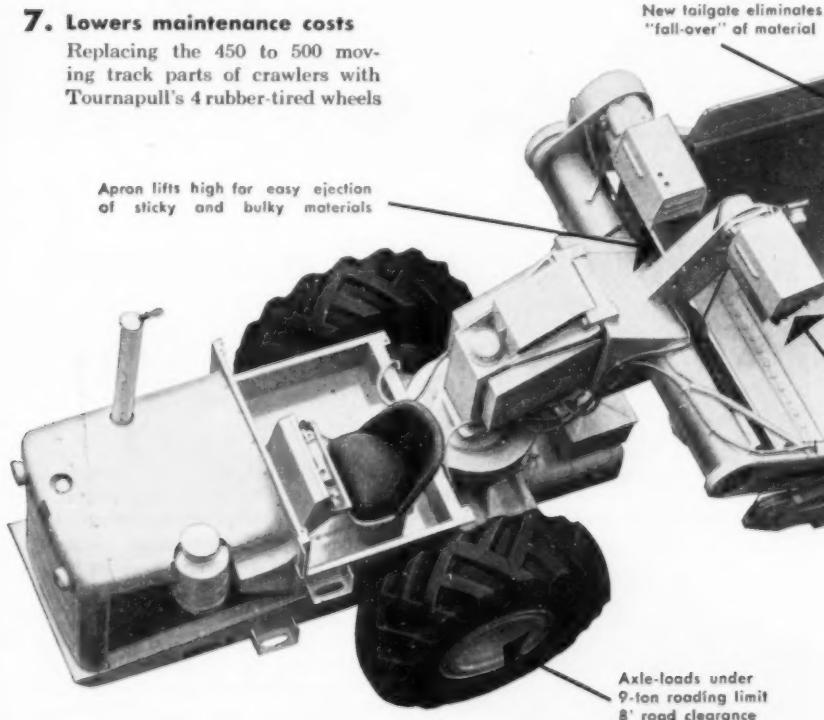
ances, around sharp corners, and through congested city and fast open-highway traffic.

10. Interchangeable equipment

Scraper interchanges with other hauled units . . . rear-dump, side-dump or flat-bed haulers. There is also a 10-ton lift-and-carry crane, a winch-and-arch for skidding poles, logs, pipe. Dozer blade or snow-plow attaches to front-end. It's easy to keep this handyman always busy.



Apron lifts high for easy ejection of sticky and bulky materials



**See owner reports
on "Handyman" Scrapers on next page ▶**

**More about
"Handyman" Scrapers**



**Study your "handyman" scraper problem...
check performance with other D Tournapull owners**

We've been in this specialized business of engineering, building and maintaining a fast-traveling, handyman scraper for small-yardage and scattered dirtmoving assignments for over 9 years. Our field engineers have time-studied jobs like yours in about every kind of dirt, terrain, and climate the world around. We've continuously checked parts orders, as well as maintenance-and-repair records, on

thousands of these machines. We've applied all this know-how of your earthmoving problems, and our ma-



chine performance, to perfect a high-speed, highly maneuverable, thoroughly dependable dirtmover for your job maintenance, pioneering, clean-up, subdivision grading, landscaping and other small-yardage dirtmoving assignments. Our "D" is a proven rig and we think it will make you the best buy on the market. Why not see for yourself? Write or call your nearest distributor for price and delivery.



Handle production, clean-up work

On 45-acre Hillcrest Estates Subdivision, Vallejo, Calif., 3 "D's" did clean-up for J. S. Equipment Co. They handled light cuts for streets, cleaned-up and filled around houses, did fine grading, and spread topsoil.



"D" moves 60%; 5 trucks, 40%

Extending Paipa, Colombia airport runway, one "D" moved 180,000 yds. of fill for Pablo de Narvaez Ingeniero Contratista, Bogota. $\frac{3}{4}$ -yd. shovel and 5 trucks moved 120,000 yds. "D" averaged five 5,350-ft. cycles/hr.



Put turnpike finishing ahead

Near Avery, Ohio, 3 "D's" hauled fill for sub-grades, fine-graded, spread topsoil, did all clean-up on $4\frac{1}{2}$ miles of Ohio Turnpike, to help D. R. Smalley & Sons, Inc., Celina, Ohio, complete finish-work ahead of schedule.



Mine glass and foundry sands

At pits owned by Industrial Sand and Engineering Co., Ltd., Pretoria, South Africa, 2 "D's" mine 15,500 tons of sand monthly. Self-loading rigs average 0.8-mile cycles (pit to washing plant) in 4.4 minutes.



Fine-grades between forms

When Winkelman-Tompkins-Jones, Plattsburgh, N.Y., built runways for the Plattsburgh Air Force Base, blow-sand left imperfections in grade between forms. D Tournapull leveled narrow surfaces quickly and accurately.



Build outdoor theater bowl

To change gravel-pit into a drive-in amphitheater, George O. Walker Construction Co., Dallas, Tex., moved 120,000 yds. of sand, caliche in 60 days with 5 "D's". Machines averaged 2,400-ft. cycles in 3 min. 22 sec.



Lick steep grades, spongy footing

Hauling 675 ft. uphill, over soft ground, 2 "D's" averaged 190 $6\frac{1}{2}$ -yd. loads of clay in 10 hrs. for Graves Brothers Co., Pine Bluff, Ark. They were rebuilding $2\frac{1}{2}$ miles of State Hwy. 1, leading to an Arkansas River levee.



Reclaim flood-damaged farm

Repairing flash-flood damage at a 155-acre Mass. tobacco farm, 3 "D's", owned by Mel Shallow, Lowell, removed silt, filled gorges, replaced topsoil. One-month job involved 112,000 yds. of sand, silt, loam, and gravel.



Speed finish-work

S. J. Groves & Sons Co., Minneapolis, assigned 5 "D's" to finish-work on $12\frac{1}{2}$ miles of Indiana Turnpike, near Howe. Here a "D" levels shoulders. Low-pressure tires roll over new pavement without causing damage.



Build earth coal-storage bins

Gibraltar Coal Company, Central City, Ky., stores coal in earth cones to avoid stockpile maintenance. Building cone pictured, 2 "D's" completed 5,160-ft. cycles delivered 6.7 yds. of clay each, in about 7 minutes.



Maneuver on dikes, 14-ft. wide

Hauling fill to build dikes for 1200-acre Wildlife Refuge near Oceanville, N. J., 5 "D's" owned by A. D. Beyer & Sons, Inc., Williamstown, traveled 26,600-ft. cycles in 19 minutes, made 180° turns in 14-foot space.



42 jobs in 27 months

Reca Construction Co., Gardnerville, Nev., used 3 "D's" on 42 widely scattered earth-moving jobs in 27 months. Picture shows Naval Air Station, Fallon, Nev., where "D's" completed three 4.4-mile cycles hourly.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-1261-G

Today's improved "D" outperforms these earlier models.



LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company



See you at the ROAD SHOW • Chicago • January 28-February 2, 1957

Defense of Blast Damage Claims

"My Foundation Settled"

"We Want \$100,000"

"You Broke Our Windows"

A growing volume of blasting work in built-up areas focuses on necessity of anticipating lawsuits—and of having services of specialized counsel as well as seismographic data and expert witnesses.

By Stratton O. Hammon

President, Vibration Damage Specialists, Louisville, Kentucky

THE expanded roadbuilding program will not only strain the capacities of the highway industry, but it will just as certainly strain the capacities of the dockets of our courts. Damage suits follow blasting and pile driving operations as night follows day. As we face the greatest peacetime construction job in history, we must remember that, stemming from it, we are also faced with possibly the greatest (peacetime or wartime) volume of litigation in history.

Ordinary construction through open country brings enough suits in its wake, as we have well learned from doing this type of service work for the great pipeline companies crossing the nation. One of the greatest of the pipelines, with a safety engineer working constantly with each spread, in 1955, paid out on the average \$2,000 damages per mile in addition to their insurance coverage.

But all of the expanding highway expenditure will not be in open country. Thirty percent of the construction is earmarked for densely populated towns and cities and here the incidence of damage claims will also be dense. We had a recent example which will illustrate the serious proportions to which these things can go.

A large Pennsylvania contracting firm, in clearing a site in a small town

across the Ohio River from Cincinnati, was forced to use explosives to remove limestone and shale. He proceeded with the utmost caution and care, in that he employed a dynamite expert from one of the powder companies to supervise his drilling, loading and firing. The police and fire departments were called at each blast and had representatives on the site. All people who wished were called and warned before each blast and all complaints were investigated at once.

241 Claims Filed

In spite of this care, 241 claims were filed charging damage. We inspected all of these claims and found two actual and 239 unfounded, which is about the usual average. The liability insurance company paid off the actual claims within the week. Thirteen of these claims (see illustration) were beyond a one-mile radius. One was located beyond a navigable river and a large steel mill. The total of these claims amount roughly to \$400,000 while the liability insurance carried was \$100,000.

• *Some Claims Fantastic.* We have serviced a claim in Indiana, for one of the largest quarry owners in the coun-

try, which was situated seven miles from the quarry! To properly understand just how fantastic such a claim is, one has only to remember that the atom bombs at Hiroshima and Nagasaki did moderate damage out to a radius of 1½ miles, and partial damage out to two miles. Yet, this claim was made in all seriousness, even though the charge detonated was only that usually, normally, and customarily used in quarries.

The solid core of the cause of this condition is the steady increase in density of population, plus the increase in the yearly consumption of commercial explosives—plus growing awareness of a segment of the public that conditions are such that considerable sums can be obtained because of claimed damage to structures, allegedly from blasting. Since each underlying factor is destined to grow and spread, the present bad situation must also necessarily become worse. It is neither possible or desirable to control the first two factors, those of population or the use of explosives. Corrective measures must be applied to the third factor, to the conditions which make it possible for claims to be collected when unwarranted and without any basis in fact.

Realize that throughout this article we are writing mainly about the unfounded and sometimes fraudulent claim. In our experience, covering thousands of cases, the insurance companies or the operator has never failed to pay off promptly those claims which we could trace to actual blast damage, nor have we ever heard of a refusal to pay under these circumstances. Indeed, if the insurance companies have a fault, it lies in the direction of paying off too easily, which increases the rates to the fair and honest and acts as an inducement to others to file claims.

• *Better Specialist Knowledge.* The first corrective measure to alleviate the bad and deteriorating situation, is to insist that the vibration damage specialists set about increasing their efficiency by broadening and perfecting their services. These men are your first line of defense, and when you commission them you have a right to expect that they be qualified to marshal every possible profession, science, and knowledge to your aid in a manner which has the most telling effect. In the past the record in defending blast damage claims has been generally bad. What little success there has

been, happened mainly because the plaintiffs have not had an expert of their own to testify. I am sure that the other vibration damage specialists have shared our experience of having to refuse numerous offers of employment from those trying to collect damages. Imagine what would happen if the National Association of Compensation Claimants Attorneys (there is such an organization), decided to develop their own specialist in explosive engineering and send him about the country to testify against you in their various cases! Under the present state of mind of the judges and juries, and the disinterested attitude of the construction industries, it would be like shooting fish in a rain barrel! Granting that such a man could not use scientific proof as one of his weapons, this would slow him down very little; for scientific proof is very little considered or even recognized by judges and juries. Otherwise, this entire situation simply would not exist, for the scientific proof is usually very easy to obtain.

Seismological Reports

In the past, too much dependence has been placed upon organizing the defense of a case around this scientific proof in the form of seismological and explosive engineering reports. The solution to legal problems arising from blast damage effects does not lie alone in this field, far from it. One of the most successful and prominent insurance lawyers once said, "Seismology and explosive engineering testimony, proving vibrations were not of a magnitude sufficient to damage a structure is negative testimony and worth 20% in winning a blast damage suit. The testimony of an architect, tracing the damage to its true source, is positive evidence and worth 30% in winning. The remaining 50% depends entirely on the legal sixth-sense and court room know-how of the expert witness!"

Do not misunderstand, seismological and explosive engineering techniques are indispensable, but should not be considered all-important. We use them constantly day in and day out, and in our minds a seismogram showing that a vibration claimed to be damaging is in reality only one-tenth of that created by ordinary walking in a structure should end the case then and there. But our ancient and honorable legal system does not function that way. Just a few weeks ago a Federal judge hearing a case in Oxford, Mississippi (Faulkner's home town and the locale for most of his novels), refused even to look at a seismic recording containing absolute scientific proof relating to the case at bar, preferring instead to give credibility in scientific matters to the testimony of the local minister and others equally lacking in any knowledge concerning vibrations.

Architect's Role. Furthermore, from a legal standpoint, even the best of seismologists and explosive engineers are considered to be authorities only on the source of the vibrations and their transmission through the earth or air to the structure. In the structure itself only the architect or the structural engineer is deemed an authority and allowed to testify freely to his findings. The following excerpts from Docket No. 1511 of the Supreme Court of New Jersey show the trouble into which a seismologist will run in court:

(One of the leading seismologists is sworn)

Direct examination by Mr. Price:

Question: What is your profession? I am a seismologist. Q. What is that? A. A student of earthquakes and vibrations. Q. I wish you would describe or explain to the jury what the general relationship is between building construction such as of brick or the roof construction such as involved in the Baker Theater and the existence of glass with reference to the effect of explosive force upon it?

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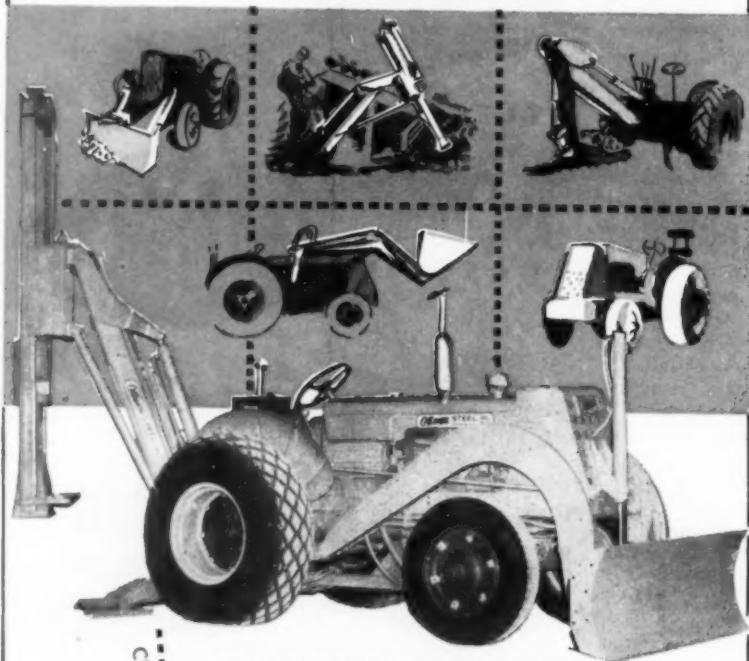
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... for more details circle 232, page 16



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26



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Mr. Gennet: If your Honor please, I object to the question. There has been no qualification of this man as having to do anything with engineering or construction engineering or whether he knows anything about structures of buildings. Your Honor has ruled on engineers and their limits on buildings, and I think we should have a rule at this point as to the qualifications of that man who is a seismologist on the structural phases of the building.

Mr. Price: If your Honor please, I could develop it further. I thought I had. I'd like to ask a few more questions since the question I put to him has been objected to. I'd like to disgress a moment to ask a few more questions about his studies in that regard.

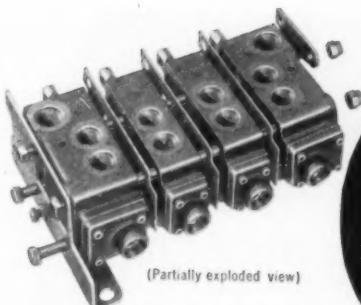
The Court: The witness has testified that he has studied the effects of air waves through the ground or the force of explosions through the air and studied the effects upon buildings. But, I think it may be well to ask him some more questions because, as far as I remember, that is as much as he said.

Question: And have you made experiments and given study to the effect of the transmission of explosive force through the air as related to glass? A. Yes. Q. Windows and so forth? A. Yes. Q. My question was, and I will repeat substantially, as I did before. . . .

Mr. Gennet: If your Honor please, I still make the same objection that I made to this same question before. This witness is not qualified as an engineer in any sense of the word, and he is not qualified to testify as to the structural effect on structures because he hasn't even indicated that he has made any study of it and the study referred to, of course apparently private study; so that I feel that he is not qualified in any fashion to testify concerning structural damage to buildings as a result of either air blasts or even as the result of earth blasts.

• *Case Lost.* As might have been expected the case was lost. It may have been different if, in this emergency, the defense attorney had been able to say, "Your Honor, our witness is also a registered architect and therefore competent to testify on all the internal reactions of this building."

The architect also has the ability to more than double the amount of evidence which can be organized into the defense of a blast damage case. He (Continued on page 89)

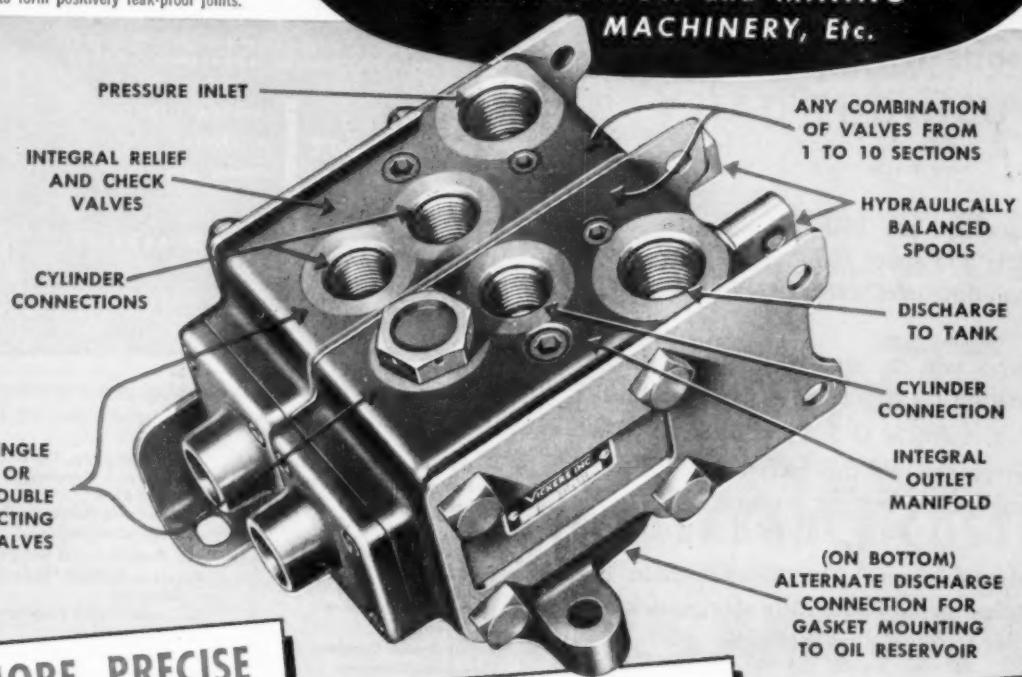


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Blast Damage Claims

(Continued from page 86)

can trace down each item of alleged damage to its true cause and this evidence added to the seismological evidence makes a more imposing file. However, it is his ability, legally, to deliver the story of the defense without ham-stringing objections by the opposing lawyers which makes the architect most valuable. Indeed an ancient word has been revived to describe such a person having a dual ability in the profession of architecture and the science of earth movement. Tectonist or tectonicologist from the Latin *tectonicus*. Websters Collegiate Dictionary gives; tectonic; structural; constructional; especially: a. architectural. b. geological pertaining to structures resulting from the deformation of the earth's crust. Tectonics; 1. The science or art of construction of buildings. 2. Geology concerned with structures.

There is another angle which makes the architect desirable in these cases. His testimony is positive while that of seismologist is negative and in legal matters positive testimony per se is considered to be of more weight than negative. (e.g. 20 American Jurisprudence, Evidence #254,1186). It has also been my personal experience that a jury will be able to understand and follow an architect's explanation of what has happened since he is dealing with ordinary items of construction with which the jury is familiar in their everyday life but that when the seismologist begins to talk of amplitude, acceleration in terms of gravity, energy-ration theory, et cetera, the attention of the jury is lost.

• *Good Witness' Value.* It is at this point that the ability of a good expert witness comes into play. He must take a passage, like the following, at a glance, (well maybe two glances): "Postulate ground displacements of sinusoidal shape which means the ground velocities and accelerations will also be sinusoidal. This, however, will not be found convenient in connection with phase-plane analysis. Instead we will assume rectangular or block accelerations of the ground, and inquire about the resemblance of the consequent parabolic displacements to the sinusoidal ones." And not only reduce it to everyday language that the average juror can understand, but do it in such a way that he is kept interested. Jurors sometime are so very average. One of our recent juries contained three notorious town bums and one convicted felon! It wasn't easy

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to make them understand what the trial was about.

A good witness should have some training in law and a great deal of experience in courts. Even seasoned attorneys often tremble and perspire with the tension of trial hence it is little wonder that many witnesses are so distraught that they cannot properly present the evidence. A good witness is also one to which being in court is such "old hat" that he is relaxed or who is that rare type whose mind functions far faster and more clearly in the emergency of cross-examination than it does in ordinary times. He should be able to handle the sneering sarcastic opposing counsel with the same confident self assurance that he does the one who is over polite. Indeed smart attorneys will not cross-examine a competent hostile witness at all.

Sometimes such a witness is in court more than the busiest of trial lawyers. And in his own narrow speciality he begins, after many years, to pick up ideas in regard to the law, evidence, and court room maneuver from one attorney which he can carry on to the next. In such an event he is especially valuable to lawyers who have never before encountered this particular type of case.

Make no mistake about it, a blast

damage claim is more than ordinarily difficult to defend and hence requires a more than ordinary astute attorney. This is because the judges and juries do not have open minds on the subject, because the proof which can win the day for the operator is of the type which is most difficult to introduce under the rules of evidence by which the courts are more or less governed, because legally, the plaintiff always has an edge on the defendant, and because the juries always lean toward the householder and away from the corporations.

It is of the utmost importance that the attorney be selected with great care, for there is only one in a hundred capable of successfully handling this type of case. He must be the rare lawyer who works hard in reading the law and organizing his case. He must gather the precedents applying to his case to such an extent that the judge is bound within certain limits. He must plan and plot the introduction of evidence so that it all finally ends up on the record. He must question and rehearse his witnesses so that they will function on the stand without any surprise to him, and so that any unstable witnesses may be eliminated. He must know his tactician well enough to drain every shred of valuable evidence out of him by proper questioning.

• *Indolent Attorneys.* Many attorneys are fine at organizing a case out of court but then go all to pieces under the stress of trial. Others are too indolent to work hard on preparing a case and depend mainly on their court room generalship. Both these types should be eliminated. In selecting a man the local situation should be studied, the past reputation of the judge, the bearing of politics, the prestige of the various legal firms, et cetera. The very best lawyer is none too good.

Many operators shrug the whole matter off and leave it to the insurance companies, and this is another reason why the efficiency with which these matters have been handled, has not been of the highest. The insurance industry is tremendous and this type of claim is a tiny segment requiring unusually delicate treatment. Instead it is likely that the same general treatment afforded other claims is applied.

For instance, because of sheer volume and other reasons some insurance companies engage law firms that are really "legal factories." They lose their one or two man control and the personal touch. These firms process cases by the score. They go to extremes to avoid trying a case, well knowing that twenty can be compro-

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ROADS AND STREETS, November, 1956

mised while one is being tried in court. The result is that the losses mount and the following year or two the insurance rates rise. It is absolutely necessary that any unusual losses be reflected in the adjustment of rates, or the insurance industry would be out of business in a few short years since they operate on such a close margin. It is also true that any losses will be taken into consideration by the actuaries in that particular type of insurance and not spread over other categories. Road contraction liability insurance rates, for instance, are based on the immediate past history of such liability losses.

• *Insurance Company Role.* It is far more economical for the operator to look upon the insurance carrier as a partner and co-operate in every way to control losses. We service one cross-country pipe line company that has worked out a co-insurance arrangement with one of the largest insurance companies. Ordinarily we are commissioned by whoever stands to lose if a claim is honored, but in the case of this pipe line company, where they were responsible for 50% of the losses, they call us first 90% of the time.

There is yet another device which increases the efficiency of blast damage control—the pre-survey. This is a detailed examination of all structures surrounding or along the route of a blasting operation. It is used by contractors especially in locations where the inhabitants are known to be sensitive to blasting, or in crowded work.

• *Pre-Survey Advantages.* The most happy by-product of pre-surveys has been that in all cases in our experience the contractor or operator having the pre-survey made has obtained a reduction in insurance premiums which has exceeded the cost of the survey. The pre-survey was obtained at no more trouble than a telephone call, saved thousands of dollars for the contractor, and untold bother and worry later on in reducing or eliminating claims. The benefits of such an arrangement include the general public which obtained lowered costs on its public roads and streets and a reduction of cases on its already overcrowded court dockets, the insurance carrier who will thereby reduce final losses, and obviously the contractor,

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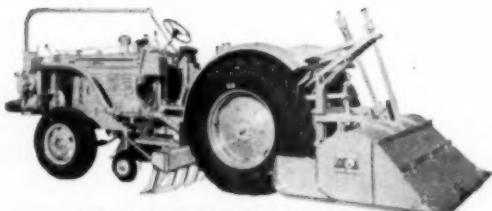
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ROADS AND STREETS, November, 1956

When Should Your Equipment Be Replaced?

By R. L. Peurifoy

Professor of Construction Engineering, Texas A & M College

Analyzing the factors that make up the cost of owning and operating a machine, and that enable the owner to know when it's time to junk the equipment or trade it.

A HIGHWAY contractor frequently has several hundred thousand to several million dollars invested in equipment, the primary purpose of which is to earn its owner a profit. In order that the contractor may realize the maximum possible profit from the use of such equipment he must have reasonably accurate information showing that the cost of owning and operating this equipment. From this cost information he can determine the charge that should be made for the use of equipment on a project, and the time at which a unit of equipment should be replaced with a new unit, in the interest of economy.

The age at which a machine should be replaced with a new machine, in order to avoid an increase in future costs of producing work with that machine, may be defined as the economic life of the unit.

During the early part of its life a machine will operate at a relatively high efficiency, and at a relatively low cost for maintenance and repairs. As the machine grows older the efficiency usually will decrease, and the cost

of maintenance and repairs will increase. Ultimately the time will come when it will not be economical to continue to use the machine. This is the proper time to dispose of it. It is seldom possible to establish this exact time with a high degree of accuracy. But adequate records, showing cost information, will enable the owner to determine the time range during which the machine should be disposed of. This range may be defined as the minimum cost range. The economic life of the machine lies within this range. If the machine is disposed of before reaching this range, the cost of each unit of work produced will be unnecessarily high, while if the machine is continued in service beyond this range, the cost per unit of work will also be high.

The cost of owning and operating construction equipment may be divided into several categories, such as the following items:

1. Depreciation
2. Maintenance and repairs
3. Investment
4. Fuel and lubrication

• *Depreciation* represents a loss in value due to age and use. Regardless of the care given a machine, it will experience a loss in value as it is used. Depreciation is a real cost which must be considered when determining the cost of owning and operating equipment. This cost is recognized by the U.S. Bureau of Internal Revenue in establishing profits for tax purposes. Any one of several methods of determining this cost may be used. They include the straight-line, declining balance, and sum-of-the-digits methods. Each method gives results which are assumed to represent the rate of depreciation for a given machine or a group of machines. The true cost of depreciation, which will not be known until a machine is disposed of, will not necessarily be equal to the amount determined by the use of one of these methods.

The straight-line depreciation method, which is the only one that will be considered in this article, assumes that the value of a machine will decrease at a uniform rate during its useful life, and that at the end of its

Table I
Example of Method of Determining a Machine's Economic Life

Time used, hour (1)	Net salvage value (2)	Cost of depreciation (3)	Average cost per hour		Cumulative cost		Total cost per hour (8)	Efficiency, per cent (9)	Output, units per hour (10)	Cost per unit of production (11)
			Depreciation (4)	Repairs (5)	Repairs (6)	Depreciation and repairs (7)				
2000	\$41,000	\$15,000	\$7.50	\$1.86	\$ 3,720	\$ 18,720	\$9.36	100	200	\$0.0468
4000	29,000	27,000	6.75	2.44	8,600	35,600	8.90	98	196	0.0453
6000	21,000	35,000	5.83	3.24	15,080	50,080	8.35	96	192	0.0434
8000	15,000	41,000	5.12	3.85	22,780	63,780	7.97	94	188	0.0422
10000	11,000	45,000	4.50	4.76	32,300	77,300	7.73	92	184	0.0421
12000	8,000	48,000	4.00	5.82	43,940	91,940	7.62	90	180	0.0424
14000	6,500	49,500	3.54	6.91	57,760	107,260	7.68	85	170	0.0452
16000	4,700	51,300	3.22	7.68	73,120	124,420	7.78	80	160	0.0487

life it may or may not have a salvage value. The salvage value, if any, should be the net amount that can be recovered from the disposal of the machine, which is equal to the amount received from its sale, less any cost of making it ready for sale.

As an example, consider a power shovel whose original total cost to the owner is \$56,000. If it is assumed that this shovel will have a useful life of six years, with a probable net salvage value of \$8,000 at that time, the total cost of depreciation will be $\$56,000 - \$8,000 = \$48,000$. Using the straight-line method of depreciation, the annual cost of depreciation will be $\$48,000 \div 6 = \$8,000$. If the actual salvage value proves to be more or less than the amount assumed, the true cost of depreciation will be less or more than \$8,000 per year, respectively.

The book value of a machine is simply a value for accounting purposes, which is equal to the original cost less the cumulative amounts that have been deducted for depreciation at any given time. The true value may be more or less than the book value, depending on the condition of the machine and the market for used equipment of that type.

Depreciation Cost

The cost of depreciation may be expressed in terms of years, months, weeks, shifts, hours, or units of work produced. If the power shovel previously referred to is operated 2,000 hours per year, the cost of depreciation per hour will be $\$8,000 \div 2,000 = \4.00 . If the shovel will excavate an average of 200 cu. yd. of earth per hour, the cost of depreciation per cubic yard of earth will be $\$4.00 \div 200 = \0.02 .

If other than the straight-line methods of depreciation are used they will give higher costs during the yearly periods of life and lower costs during the latter periods of life for a machine.

• Maintenance and Repair. The cost of maintenance and repairs should include the cost of labor and parts for repairing, overhauling and other operations that are necessary in order to keep a machine in working condition. This cost may be assumed, based on experiences gained from other similar machines, or it may be determined from cost records after a machine has been in use.

The cost history of most machines reveals that maintenance and minor repairs are necessary from time to time as the needs arise; then, after longer intervals of use, major overhauls are necessary in order to keep

Illustrating Wide Range in Repair Costs

Equipment number	Description of equipment	Number of shifts worked	Cost of repairs per shift
1407	Dragline	1,221	\$32.33
1410	Dragline	1,556	10.49
4811	Motor grader	1,460	5.64
4812	Motor grader	1,521	2.43

the machine operating. Usually the time to consider disposing of a machine will be just prior to performing a major overhaul at considerable expense.

The cost of maintenance and repairs for presumably identical machines will not necessarily be the same. Variations in costs are influenced by several factors, including the type of work performed, the severity of job conditions, the operator, and the care in providing maintenance and repairs. The extent to which these costs may differ is illustrated by the data given in the accompanying table. The cost of repairs for two draglines and two motor graders, of the same manufacture and size, respectively, were obtained from records of a contractor. The data covers a period of five years for all machines, 1950 through 1954. The periods of time worked and the cost of repairs per period were as tabulated.

Cost information such as this may influence a decision to retain or dispose of a machine.

• Investment costs include interest on the unrecovered portion of the cost of a machine, plus taxes, insurance, and storage. While these costs will vary with owners and locations, values based on a national survey indicate a combined rate of 10 per cent of the average value of a machine per year during the period it is used. The average value of a machine, expressed as a per cent of its original cost, may be determined from the formula

$$P = \frac{(1 + n)}{2n} X 100$$

where P = the average value of a machine as a percent of the original cost

where n = the number of years in the depreciation period

Assume that a machine will cost \$10,000, and that it will have a useful life of 5 years, with no net salvage value after 5 years. The average value during the 5 years will be

$$P = \frac{(1 + 5)}{2 \times 5} X 100 = 60 \text{ per cent of the original cost}$$

$$= 0.60 \times \$10,000 = \$6,000$$

The average annual investment cost will be

$$0.1 \times \$6,000 = \$600.00$$

If the machine will have a net salvage value of \$2,000 after 5 years, the total depreciation will be \$8,000 instead of \$10,000. The average value during the 5 years will be

$$P = \$2,000 + \frac{(1 + 5)}{2 \times 5} X \$8,000$$

$$= \$2,000 + \$4,800 = \$6,800$$

If there is no appreciable change in the consumption of fuel and lubricating oil per unit of time during the period a machine is used, and if a new machine that is being considered for purchase will not likely experience a change in consumption, the cost of fuel and lubrication may be neglected in a study made to determine if a machine should be disposed of. However, if the consumption varies with age, or if a new machine will likely experience a different rate of consumption, these costs should be considered. It will be necessary to keep records of consumption in order to establish these costs.

Rate of Production

If the rate of production of a machine declines with age, and if, during the same time operating costs per unit of time remain constant or increase, there will be an increase in the cost of producing a unit of work. Since the owner of a machine is interested in the unit cost of production, the operating efficiency should be considered when determining whether to retain or dispose of a machine.

• Example of Economic Life. An example that illustrates a method of determining the economic life of a machine is given in Table 1. The machine is a 2½-cu. yd. power shovel, whose total cost to the owner was \$56,000. This shovel has been used an average of 2,000 hours per year for 8 years. Column (2) lists the net true salvage values at the end of each year, rather than the book values, which have little meaning in a study such as this.

In Column (5) the average cost
(Continued on page 100)

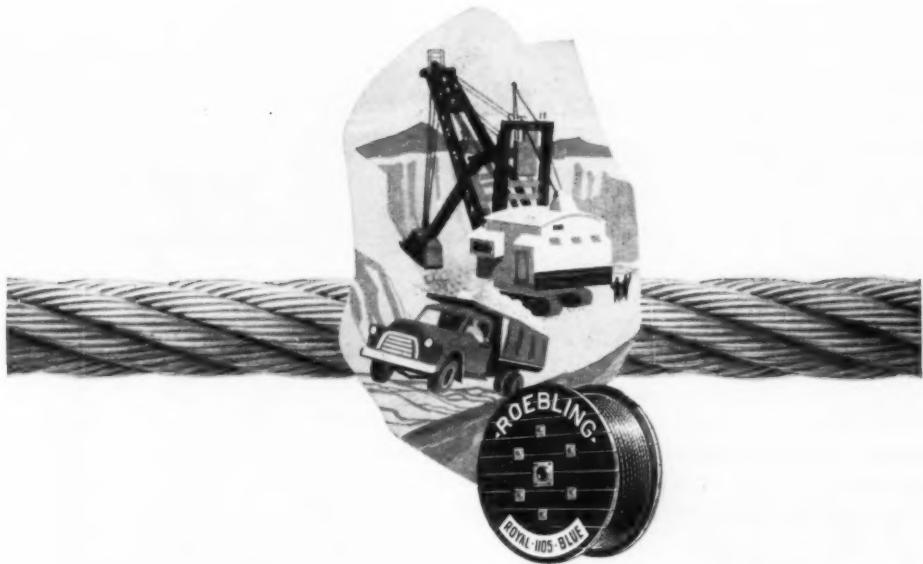
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ROADS AND STREETS, November, 1956



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- types 24, 34, 44, 54 and 703 available with truck mounting

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- rotating assemblies have same basic features as corresponding crawler type machines.

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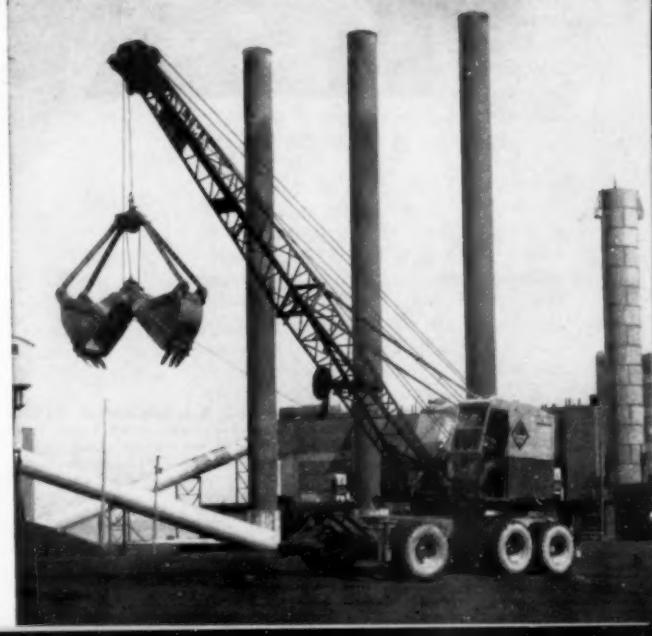
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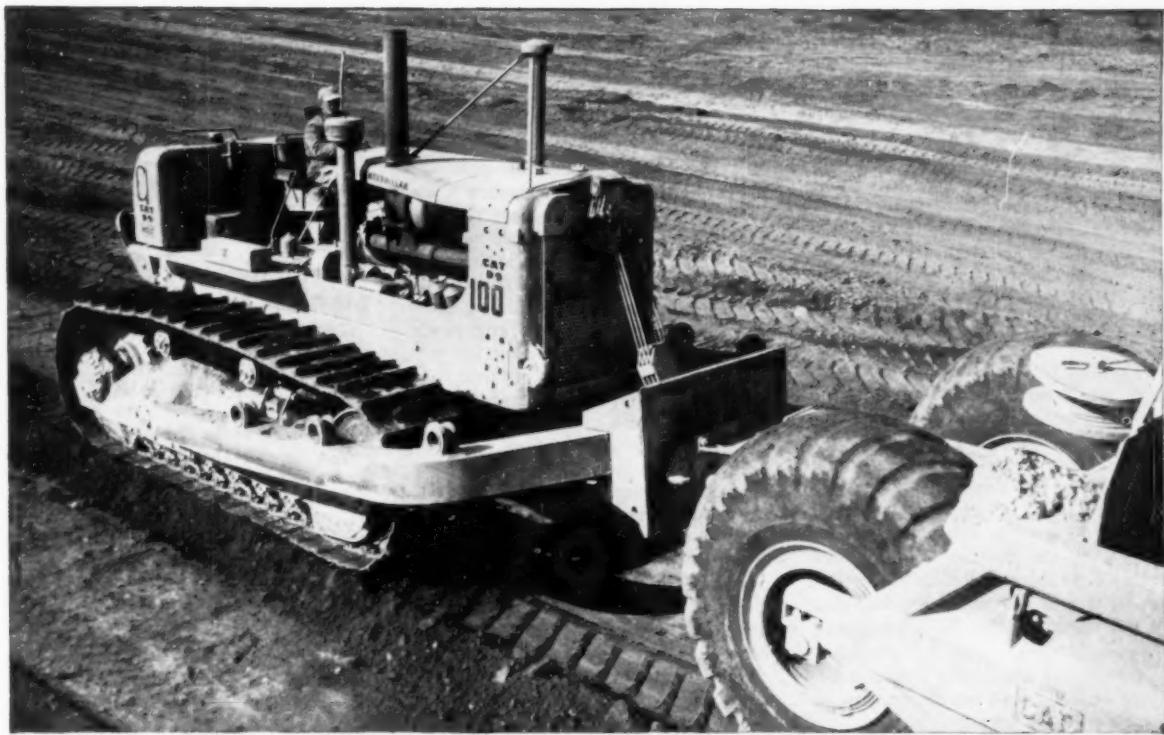
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... for more details circle 187, page 16





Caterpillar D9 Tractor push loading a DW20 Tractor and No. 456 scraper unit near San Antonio, Texas. Both D8 and D9 Tractors have Cat Torque Converter Drive available as optional equipment—standardizing on Twin Disc Torque Converter components.

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. . . for more details circle 260, page 16

ROADS AND STREETS, November, 1956

Equipment Replacement

(Continued from page 96)

per hour for repairs is the cost during the particular 2,000-hour period whose ending is given in Column (1). For example, during the first 2,000 hours of use the average cost of repairs was \$1.86 per hour, whereas during the period from 8,000 to 10,000 hours the average cost of repairs was \$3.85 per hour. The cost of repairs includes the cost of major overhauls.

Column (8) gives the average total cost per hour for depreciation and repairs during the entire life of the machine through the specified time used. The lowest cost per hour would be obtained by disposing of the machine after 12,000 hours. However, if the decline in efficiency, as reflected by the decline in production rates, is considered, the lowest cost of production is obtained by disposing of the machine after 10,000 hours of use.

Continuing to use the machine beyond 10,000 hours would result in an increase in the cost per unit of production. It will be noted that the difference in the cost per unit of pro-

duction between 8,000 and 12,000 hours is small. Thus, the economic life of this machine is between 8,000 and 12,000 hours, or between 4 and 6 years.

• **Down Time.** If a machine performs a complete operation in such a manner that other machines are not dependent on it, the down time of such a machine results in a work stoppage whose cost is chargeable to this machine only. For example, if one tractor scraper unit out of a gang of six units breaks down the production will be reduced by one-sixth, but the other units will continue to operate. However, if a prime machine, such as a power shovel that is loading earth for several trucks breaks down the entire production stops. The cost of the shovel plus the cost of the idle trucks during the down time should be charged to the shovel. Thus, a low operating efficiency for a prime machine is of greater significance than for a machine which is not responsible for the operation of other machines.

The owner of construction equipment who wishes to produce work at the lowest possible cost must maintain cost and production data in order to know when to replace an old ma-

chine with a new one. Failure to do this will likely result in production costs which are greater than are necessary.

Professor Peurifoy is the author of two books related to construction, "Estimating Construction Costs," and "Construction Planning, Equipment and Methods," both published by the McGraw-Hill Book Company.

Federal highway engineer positions announced

The United States Civil Service Commission has announced examinations for Highway Engineer and Bridge Engineer positions paying \$5,335 to \$8,990 a year, for duty principally with the Bureau of Public Roads of the Department of Commerce, in Washington, D. C., and throughout the United States.

Applicants must have had appropriate engineering education and experience. For positions paying up to \$6,115 a year, education alone may be qualifying. Full information regarding the requirements may be obtained at many post offices throughout the country, or from the U. S. Civil Service Commission, Washington 25, D. C.

Applications will be accepted by the Board of U. S. Civil Service Examiners, Bureau of Public Roads, Department of Commerce, Washington 25, D. C., until further notice.



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... for more details circle 263, page 16

ROADS AND STREETS, November, 1956

Road show poster folder

The Road Show Publicity Committee announces that a new banner type folder has been prepared for the promotion of the coming Road Show. This folder, when opened to its full width, provides a banner suitable for hanging in offices and shops. The Road Show will be held at the International Amphitheatre in Chicago, January 28 to February 2, 1957.

General mailings of this folder have been made to interested groups. There is, however, a limited quantity available for distribution. Write to this paper or to Harvey A. Scribner, Chairman of the Road Show Publicity Committee, 155 North Wacker Drive, Chicago 6, Illinois.

ARBA highway salary survey

The American Road Builders' Association has recently completed its fourth survey of salary ranges for engineers in the various state highway departments. Copies of this latest tabulation as of April 30, 1956, are available through the ARBA Headquarters, World Center Building, Washington 6, D. C. The complete tabulation shows the minimum and maximum salaries in the 48 state highway departments for the various classifications of engineers. The averages of the 48 states are listed below:

	Averages	
	Min.	Max.
Chief Administrator-		
Commissioner	\$11,825	
Chief Engineer	\$11,077	\$12,569
Assistant to Chief		
Engineer	9,067	10,618
Bridge Engineer	8,095	9,600
Construction		
Engineer	8,297	9,835
Design Engineer	7,858	9,353
Maintenance		
Engineer	8,370	9,873
Engineer of Materials and Tests	7,792	9,301
Engineer of Surveys and Plans	7,729	9,187
Office Engineer	6,874	8,371
Right-of-Way		
Engineer	7,275	8,802
Planning Survey		
Engineer	7,742	9,123
Landscape Engineer	6,278	7,605
Traffic Engineer	7,320	8,752
Equipment Engineer	6,977	8,181
District Engineer	7,458	9,020
Secondary Roads		
Engineer	7,540	8,930
Resident Engineer	5,190	6,852
Instrument Man	3,701	4,739
Inspector	3,367	4,768
Rodman	2,592	3,352

Some recent users of Seismic Surveys

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New Thinking Needed in Urban Expressway Design, Says Wiley

Rigidity of ideas and rule-of-thumb thinking cannot be afforded in planning and designing urban facilities under the new federal highway program.

So said New York City's traffic commissioner, T. T. Wiley, when speaking at San Francisco before the annual convention of the Institute of Traffic Engineers. Wiley was critical of much of the basic design thus far brought forth for the urban interstate segments. He characterized them as generally inadequate.

"Too little attention is being paid to the detailed needs of traffic in metropolitan areas where the problem is most acute," the commissioner told the final technical session of the convention of the Institute of Traffic Engineers.

"It no longer is sufficient to merely build multiple lane, divided expressways," Mr. Wiley said. "While they will be full up in one direction at peak periods, the other side of the roadbed

will be going to waste for the most part."

Highway engineers, he said, should discard their conventional thinking. Then they should put their imagination to work, he added, planning routes that could be made reversible so that all of a highway could be used at all times.

Wiley advocated the designing of eight-lane highways with three separate roadways. Automatic controls for the center two-lane strip would permit use of the strips in either direction or both directions, he said.

For full operational efficiency on this type of road, the commissioner recommended radio-controlled signals and barriers. Such techniques have not been developed for highway use. However, Mr. Wiley said that electronic devices to control the flow of traffic on expressways merely required extension of simple principles well known to engineers.

• Other Meeting Notes: Radio beams

to control city traffic lights have been introduced on a limited basis in Chicago and a few smaller cities. They are to be installed in parts of Brooklyn and Queens early next year.

• At the request of Charles J. Murphy, traffic engineer of the Automobile Club of New York, the institute agreed to study the "misuse" of stop signs. Mr. Murphy cited Nassau County, L.I., as an example of such "misuse." Signs are being installed on the county's main roads instead of on local approach routes, he said. This slows progress on main roads and promotes disregard of stop signs, he contended. These factors help produce accidents, he said.

• J. Carl McMonagle of the Highway Traffic Center of Michigan State University, East Lansing, was elected president of the Institute. Next year's convention will be in Detroit.

• The Golden Milestone Award of the National Highway Users Conference was given this year to Governor Christian Herter of Massachusetts, in recognition of the excellence of the 1956 program report on highway development by his State's Department of Public Works.



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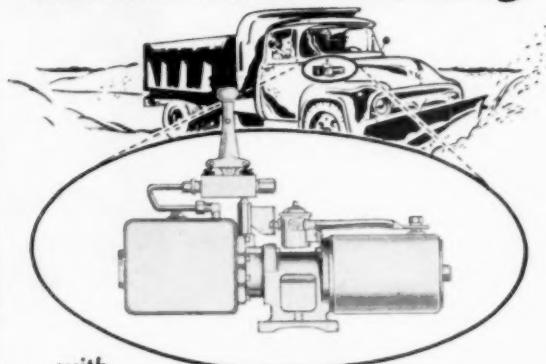
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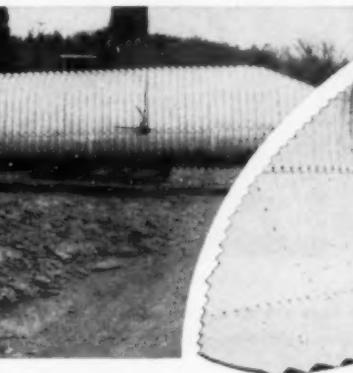


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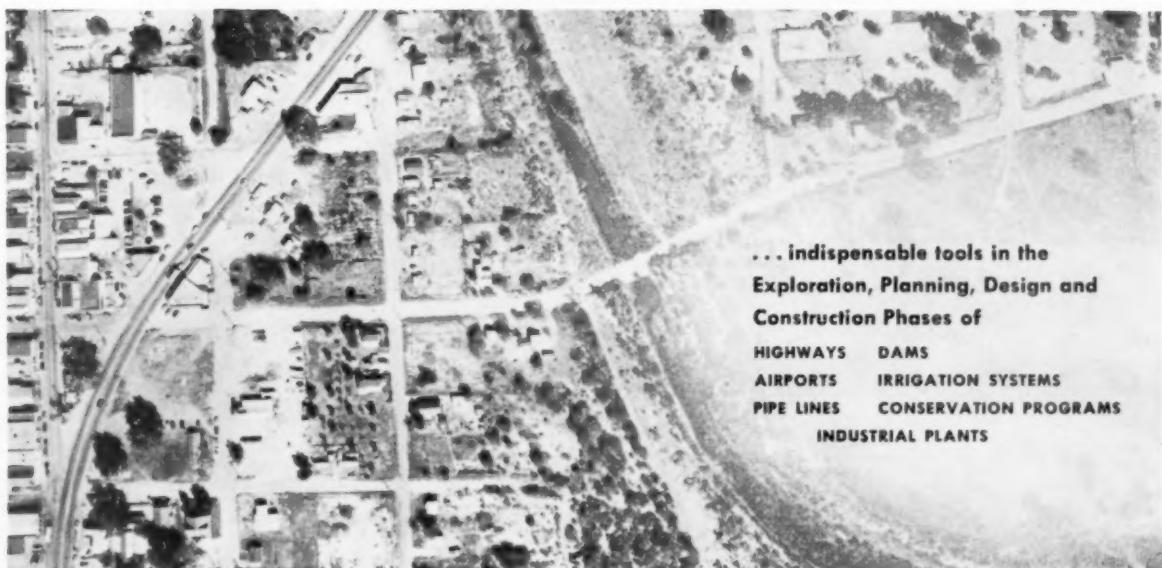
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Reader Service Coupon on Page 16

Loader for Cat D-2 Tractor

A new model TL-21 loader for long, non-oscillating track Cat D-2 tractor has been announced by Teale & Co., Box 308, Omaha 1, Neb. It is stated the TL-21 will lift a heaped $\frac{1}{2}$ yd. bucket to full 9 ft. 10 in. height (at bucket hinge points) in about 6 seconds. A new, heavy-duty, "Ram-Fill" bucket "rolls back" a full 40 degrees at ground level, for fuller loads. The "roll action" pry-out with 8500 lb. of power is stated to assure fast, smooth break-away.

When the self-leveling bucket reaches full height, the "deep-angle" dump and "positive" banging action help rid bucket of even wet, sticky material in a hurry. Bucket "roll-over" permits digging 9 in. below ground level!



Teale Model TL-21 Loader on
Cat Tractor

For more information circle 106 on
Service Coupon Page 16 and mail now.

Tractor Shovels Have New Features

Two new 4-wheel drive, pneumatic tired "Payloader" tractor shovels have been announced by The Frank G. Hough Co., 768 Seventh Ave., Libertyville, Ill. These are the model HH with a payload capacity of $1\frac{1}{2}$ cu. yd.— $1\frac{1}{4}$ cu. yd. struck; and the model HU with a payload capacity of $1\frac{1}{2}$ cu. yd. and 1 cu. yd struck.

Numerous new features have been in-



New Hough "Payloaders"

corporated in the design of both of these new units including the new Hough-designed and Hough-manufactured "Paylomatic" power-shift transmission. The necessity of coming to a stop for a "range-shift" is completely eliminated with this new "no-stop" transmission since all shifts in both forward and reverse can be made without even slowing down.

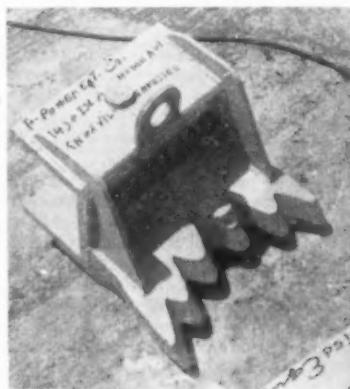
The finger-tip directional control can be operated under full engine speed, in any gear. The torque-converter gives infinite speed ratios for maximum performance. Both transmission and torque-converter use standard SAE-10 HD oil. Special, expensive oils are not required.

Adding greatly to the overall effectiveness of the four-wheel-drive of the new HU and HH models are the power-transfer differentials which are stated to provide the best possible traction under all conditions.

For more information circle 107 on
Service Coupon Page 16 and mail now.

Three-In-One Stumping Block

A new type stumping block, announced by Rockland Allied Equipment Co., 3778 West Colonial Drive, Orlando, Fla., is constructed so that it may be used as a digging, splitting, or battering ram tool. The stumping block grips into the stump,



Rockland Stumping Block

preventing unnecessary skidding and wear on tractor. This is stated to utilize and transfer the full inertia and lifting force of the tractor directly into the stump to be removed.

The stumping block is manufactured for all-sized crawler-type tractors and may be mounted on any specified land-clearing rake, bulldozer, or angle-dozer blade. It may be mounted on any portion of rake or blade by means of pins,

which may be easily removed when not needed.

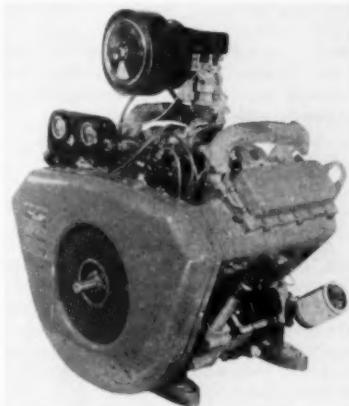
For more information circle 108 on
Service Coupon Page 16 and mail now.

Air Cooled 75 HP Engine

A new valve-in head, compact 4-cylinder vee type engine designed for all general applications in the construction, industrial, and agricultural fields has been announced by Lycoming Division, Avco Manufacturing Corp., 550 S. Main St., Stratford, Conn. Designated as the model CV4-180, the engine delivers 70 hp at 3000 rpm.

The new 4-cylinder engine features the proven design and interchangeability of major component parts with its counter part, the C2-90 model 30 hp engine such as the aluminum cylinder head of valve-in-head design, cylinder barrels, pistons, forged connecting rods, bearings, valves, etc. A full pressure lubricating system is employed.

The CV4-180 weighs approximately 463 lb. less electric starter, generator and



Model CV4-180 Engine

flywheel housing which are being offered as optional equipment. The engine power end will be offered with SAE #3, 4, and 5 bell housings as with special pump adaptors and shaft extensions to suit customer requirements. Simplified engine design assures easy installation and servicing.

For more information circle 109 on
Service Coupon Page 16 and mail now.

Engineering Advancements in TerraTrac Crawler Loaders

A number of engineering advancements in TerraTrac crawler tractor-loaders have been announced by American Tractor Corp., Churubusco (Ft. Wayne), Ind.

Outstanding new feature is a mechanical "knockout" action, which jars wet clay, muck, etc., out of the bucket instantly at all dumping heights from 2 ft. up to full lift height. This positive "forced ejection" method has been achieved by use of extra-large tilt-cylinders and by revamping the dumping mechanism, so tilt arms strike ends of lift arms as bucket swings into fully dumped position.



Model "600" TerraTrack Crawler Loader

Another new feature which helps dislodge hard-to-dump materials is an increase in bucket dumping angle. At low dump heights, buckets now roll over a full 90°, while at maximum lift height, the dumping angle has been changed to 45°, to gain more reach for dumping into high truck boxes.

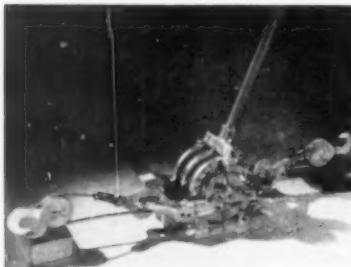
Since tilt arms on larger TerraLoader models are now reversible in the field, it is possible to increase the dumping angle to 60° at maximum lift height.

Grading angle of TerraTrac loaders has been increased. Buckets can now be rolled forward as much as 110° at ground level. Bucket roll-back angle has also been increased, to give more prying leverage and to permit carrying larger payloads without spillage.

For more information circle 110 on Service Coupon Page 16 and mail now.

Hand Winch

A heavy duty manually operated power tool, the Multi-Pul, has been placed on the market by Multipule Corporation, 1908 North Main St., Dayton 5, O. The Multi-Pul is made of Almag 35 and is equipped with self-contained servo-action brakes in each side of reel. It is available in two models—Model S-100 single reel unit has $\frac{3}{4}$ in. standard cable length of 30 ft. with 7000 lb. factory rating government specifications. Model T-101 has a 30 ft. cable on each reel. Any length cable desired can be furnished on special order up to 100 ft. on the single and 90 ft. on the twin.



Model T-101 Multi-Pul, Twin Unit

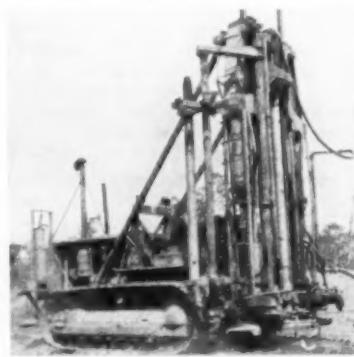
For more information circle 111 on Service Coupon Page 16 and mail now.

Tractor Mounted Rotary Drill

A new, dry-type rotary drill is now in full production by Robbins Machine & Manufacturing Co., Oneonta, Ala. It is a tractor-mounted rotary drill application. It features mechanical drive.

The first Robbins drill was mounted on a Caterpillar D6 tractor. It drilled a 9-in. blasthole and provided a 15-ft. steel change. Later models of the drill, mounted on Caterpillar D8 tractors, drill a 9-in. hole with a 25-ft. steel change. A revolving rack which holds 5 steels makes steel changes easy. Adapters are now provided for mounting the drill on non-Caterpillar crawler tractors.

Power to drive the rotary comes from the rear power takeoff of the tractor through a Fuller K8 or K11 transmission, with 4 speeds forward, 1 reverse. Through a chain drive, the transmission powers a right angle connection to a square shaft running the height of the drill unit. The square shaft powers a sliding gear box which rotates the drill steel at speeds between 25 and 120 rpm.



Robbins Drill Mounted on Caterpillar D8 Tractor

Down pressures as high as 30 tons on the drill bit are obtained by two 8-in. hydraulic cylinders operating off a 70 GPM hydraulic two-stage pump driven from power take-off of the tractor. These hydraulic pistons operate a rack and pinion that raise and lower the drill pipe by two chain sprockets, providing the necessary down pressure on the bit. Also by means of hydraulic controls, three jacks can level the tractor for drilling.

A 600 cfm. air compressor forces air into the drill pipe to blow chips and dust away from the drill bit.

Tri-Cone rock bits are used. The Robbins drill can handle bit sizes from 5 to 12-in.

The Robbins drill is claimed to have a drilling speed that compares favorably with any rotary drill on the market today. It is stated to have drilled in soft shale up to 15 ft. per minute and in average hard sandrock it is said to drill 100 ft. per hour or more.

For more information circle 112 on Service Coupon Page 16 and mail now.

Rotary Snow Plow

A new rotary snow plow for 4-wheel drive trucks has been announced by the Wm. Bros. Boiler & Mfg. Co., Road Machinery Division, 1057 Tenth Ave., S.E., Minneapolis 14, Minn.

Named the Bros Model "B" Sno-Flyer, this plow is suitable for any 4-wheel drive truck in the 17,000 GVW range. It is front-mounted by a universal hitch that permits interchange with push plows.



Bros Model "B" Sno-Flyer

It is stated to have a capacity for handling 20 tons of snow per minute, casting distances up to 75 ft. It is stated that hard, wet or chunky snow conditions do not hamper casting performance. Loading chute permits rapid loading out to truck in crowded downtown or urban streets.

The casting chute rotates 360 degrees to control placement of snow in adjacent areas. A capper on casting chute controls height of snow stream being ejected.

Cutting width of the plow is 8 ft. It is powered by an 8-cylinder industrial engine mounted on rear of truck chassis. Casting chute rotation and raising or lowering of plow are both controlled hydraulically from inside the truck cab.

For more information circle 113 on Service Coupon Page 16 and mail now.

Truck Mounted Earth Boring Machine

A truck-mounted earth boring machine with hydraulic turntable base and swivel action that permits operation at any angle over a full 180-degree arc without having to move the truck itself is one of the latest additions to the line of the Utility Division, Highway Trailer Co., Edgerton, Wis.

Hydraulic extension action also gives the earth borer an extra 22-in. "reach" within its operational radius. Manufactured at the Edgerton plant of Highway Trailer, a division of the Equipment Department of Merritt-Chapman & Scott Corporation, of New York, it is capable of digging holes from 9 to 36 in. in diameter and up to 10 ft. in depth—in any soil and on any level.



Earth Boring Machine

For more information circle 114 on Service Coupon Page 16 and mail now.

10 reasons why Liberty Mutual has been the number 1 writer of compensation insurance for 20 straight years

... and why Liberty can save you real money

1 On-the-job experience: Liberty Mutual has solved insurance problems for large and small contractors in every part of the country. Liberty has worked with them on driveways and superhighways, tunnels and towers, ranch houses and skyscrapers. Liberty knows the hazards of construction operations, knows how to help you avoid those hazards and reduce your accident rate. Ask your local Liberty office to show you how they've helped policyholders in your area, and in your field.

2 Engineering know-how: When you work with Liberty, you work with a team of Loss Prevention engineers who know your business and talk your language. Through *advance analysis* they help you plan control of potential hazards before each of your projects begins. They follow-through every step of the way, working full-time on the project when necessary. They have perfected techniques for keeping men safe, controlling damage due to blasting, improving operating methods in all types of construction projects.

3 Saving you money: Your local Liberty Mutual office can show you an up-to-date list of over 100 contractors whose insurance costs have gone down since they became Liberty policyholders. In one case there was a change of 76% . . . in another, 70% . . . and there was a 50% or better change in the insurance rates of 14 other contractors. Superior loss prevention and claims service is the principal reason Liberty consistently saves money for contractors.

4 Dividend returns: In addition to lowering the insurance rates on construction jobs, Liberty Mutual has been able to save additional dollars for its policyholders through dividend returns.

5 Research: Liberty Mutual has its own fully-staffed and equipped laboratory in which it studies overall construction safety problems as well as the spe-

cific difficulties faced by individual contractors. Out of this have come many ideas for safer operating methods, new and improved techniques to reduce tough problems.

6 Around the clock claims service: On large projects, Liberty Mutual has full-time claimsmen right on the job. Experienced, company trained claimsmen assure fast, fair handling of every claim. If there's an accident on your job, there'll be a Liberty claimsmen swinging into action fast.

7 Large medical staff: Liberty Mutual's unique medical program has drawn praise from medical authorities everywhere. Liberty has its own team of specialists available to check the diagnosis and treatment of all serious injuries. In addition, Liberty has two famous rehabilitation centers where badly injured workers learn to be useful, self-supporting citizens once again. Liberty also assists in setting up "preventive" medical programs for each large project.

8 Speedy auditing: Liberty has its own auditors, specialists in the construction field, who provide fast auditing and assure proper allocation of payroll classification.

9 Direct dealing: When you're a Liberty policyholder, you deal only with salaried employees of the company. Their interests are yours. No brokers or middlemen. This can save you money, assure you of the best insurance advice.

10 Ability to follow your operations: Liberty has branch offices in 146 cities at your service. Get in touch with the office nearest you, and ask just one question: "Can you save me money on my insurance?" If they can — they'll prove it to you!

LIBERTY MUTUAL

The Company that stands by you

Liberty Mutual Insurance Company • Liberty Mutual Fire Insurance Company • Home Office: Boston.

... for more details circle 230, page 16

ROADS AND STREETS, November, 1956



"Down Easters" extend the nation's first major Asphalt-paved Turnpike

Last December Maine opened this sweeping new expressway.

It extends the original 45-mile Maine Turnpike 66 miles . . . Portland to Augusta.

The nation's first major Asphalt-paved Turnpike, it has an enviable record for safety—for earning revenue. Asphalt construction saved over \$1,000,000 in first costs—maintenance costs have been low—income is years ahead of debt retirement needs. What better endorsement for Asphalt construction for the new Extension?

Engineers lay groundwork for even better record on Extension

Maine's engineers, looking for even better performance, made three moves in designing the Portland-Augusta Extension.

1. They depressed the median strip. This measure reduces material needs, improves drainage, simplifies snow removal.

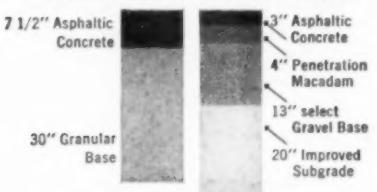
2. They reduced wearing course thickness and at the same time "beefed" up base structure by penetrating it with Asphalt. This move both cuts cost and aids flexibility and strength. (See chart for details.)

3. They paved inner and outer shoulders. As the WASHO TEST shows, this adds greatly to pavement life and cuts maintenance costs. It also improves safety.

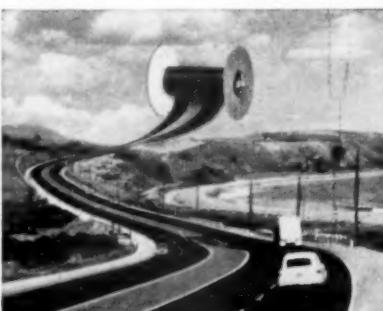
Low construction cost has already justified these measures. Maintenance costs and safety figures are expected to follow suit.

For low road costs and high road performance follow Maine's lead. Adapt modern Asphalt construction to your roads.

ORIGINAL SECTION EXTENSION SECTION



Maine Turnpike Asphalt pavement designs.



Ribbons of velvet smoothness . . .
MODERN ASPHALT HIGHWAYS



THE ASPHALT INSTITUTE, Asphalt Institute Building, College Park, Maryland

. . . for more details circle 185, page 16

Feed Line Lubricator

A new sight feed air and steam line lubricator, announced by Murray Equipment Co., Box 14, River Forest, Ill., automatically feeds and mixes the proper amount of oil to lubricate all air and steam tools from small air spade to the largest pile hammer. An adjustable valve on the sight feed mechanism controls the rate of oil feed so that a drop at a time or a steady stream is pressure-fed into the line in the form of an atomized spray.

With no moving parts the lubricator will not jam. A built-in screen prevents clogging and it operates only when tools are in use, so that flooding is impossible. Used with anti-freeze, it prevents icing of tools.



Sight Feed Lubricator

For more information circle 115 on Service Coupon Page 16 and mail now.

Three-Position Ditcher

A new ditcher able to dig to within 2½-in. of the outside edge of either its right or left-hand crawler has been announced by Gar Wood Industries, Inc., Wayne, Mich.

Designated as the Gar Wood-Buckeye 308-TP, the position of the new ditcher's digging wheel can be shifted to three different positions: To the left or right



Gar Wood-Buckeye 308-TP Ditcher

of the ditcher's mainframe, or in line with the mainframe.

The ditcher's digging wheel can be changed right in the field. No crane or special tools are needed to accomplish a change of position.

Working specifications of the new three-position ditcher include: Maximum depth of cut of 5 ft. 6 in. cutting width from 8 in. to 24 in.; and maximum obstruction clearance of 2½ in. Other features of the new machine are: Hydraulic conveyor drive, hydraulic digging wheel hoist, variable bucket spacing, split-shaft excavator drive, and simplified, grouped operator controls.

For more information circle 116 on Service Coupon Page 16 and mail now.

Instrument for Soil Density Tests

A new instrument, the Volumeasure, for in-place density tests of soils, introduced by Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill., operates on a water filled balloon principle. Water under pressure is forced into the balloon and the balloon completely fills the density hole. Pressure is developed by a hand operated pressure-vacuum bulb system which extends or retracts the balloon in a matter of seconds.

Volume measurements are read directly on a graduated cylinder which has a 1/20 cu. ft. capacity. The cylinder is precision calibrated to .00025 ft. divisions.

The volumeasure weighs less than 13 lb.



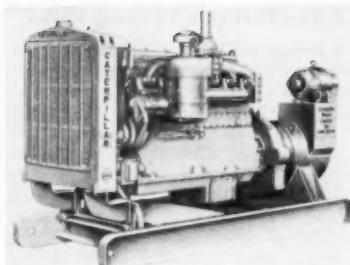
The Volumeasure

For more information circle 117 on Service Coupon Page 16 and mail now.

Diesel Electric Set

A new 100 KW self-regulated diesel electric set has been added to the expanding line of Caterpillar-built power generating equipment of Caterpillar Tractor Co., Peoria, Ill.

Known as the Cat D342 electric set, the new unit uses one of the highly compact new Caterpillar self-regulated generators to make available the principal advantages of previous self-regulated



Cat D342 Electric Set

and externally-regulated generators in one package.

In order to assure maximum efficiency, the new generator has been designed and built specifically to match the Cat D342 diesel engine. Voltage droop and terminal voltage can be adjusted on the new generator to meet the needs of special installations. After adjustment, the controls are locked and no further adjustments are required.

For more information circle 118 on Service Coupon Page 16 and mail now.

Pneumatic Tired Road Roller

A new self-propelled, 9 wheel pneumatic tired road roller, Model SR-9-0, has been announced by Rosco Manufacturing Co., Minneapolis 6, Minn.

The unit is powered by a 4-cylinder, high torque heavy duty, liquid cooled gas engine. In front are four oscillating wheels and bolster assembly; five rear drive wheels provide maximum flotation. Wide smooth tread tires provide a 69 in. rolling path with overlap. This 9-ton roller has 5 forward and 2 reverse working speeds. The short wheelbase provides a 13 ft. turning radius.



Rosco Model SR-9-0 Road Roller

For more information circle 119 on Service Coupon Page 16 and mail now.

Steering Wheel Puller

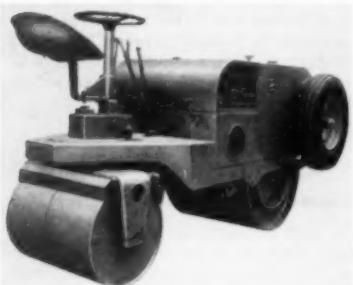
The annoying problem of pulling steering wheels has been made easy with a new puller announced by the Owatonna Tool Co., 435 Cedar St., Owatonna, Minn.

The OTC steering wheel puller has adjustable legs to permit use on practically every type of steering wheel regardless of the number of spokes and can be used as a two or three jaw puller.

For more information circle 120 on Service Coupon Page 16 and mail now.

2-3 Ton Portable Tandem Roller

A redesigned 2-3 ton portable tandem roller has been announced by Littleford Bros., Inc., Box 75, 454 E. Pearl St., Cincinnati 2, O. Known as the model 157 it offers these advantages over the previous model: The Wisconsin engine will have Stellite valves and non-positive valve rotators. This change will lengthen the life of the valves three to four times, and will give better engine performance since the valves will wear more evenly. The model 157 now has a Twin Disc clutch for smoother rolling operation. Mounted on the outside, the new clutch is readily accessible for faster, easier adjustment. Manual steering has been replaced by a new horizontal type steering system which offers part-time power steering for easier operation.



Model 157 Portable Tandem Roller

For more information circle 121 on Service Coupon Page 16 and mail now.

Tilt-Bed Trailer

A new light weight tilt-bed trailer utilizing a full-width platform and a single-wheeled tandem has been introduced to the construction industry by Spencer-Safford Loadcraft, Inc., Augusta, Kan. High-tensile, pressed-steel framework is used in the 9-ton capacity trailer to provide maximum strength with minimum weight, thus allowing the use of a full-width platform. In addition, the new trailer, numbered MT-108-RT, features a rocker beam tandem assembly, non-tilting drawbar, and double-acting hydraulic cylinders.



Loadcraft MT-108-RT Trailer

For more information circle 122 on Service Coupon Page 16 and mail now.

40 Ft. Concrete Conveyor

Elevations to 20 ft. at 30° are stated to be possible with the 40 ft. Con-Vay-It concrete special added to the Con-Vay-It line of conveyors of American Conveyor Co., 2133 South Christiana Ave., Chicago 23, Ill. Powered by a 9 h.p. Wisconsin gasoline engine this unit can pour approximately a yard per minute in the horizontal position.

A snub pulley has been added to in-



Con-Vay-It Concrete Special

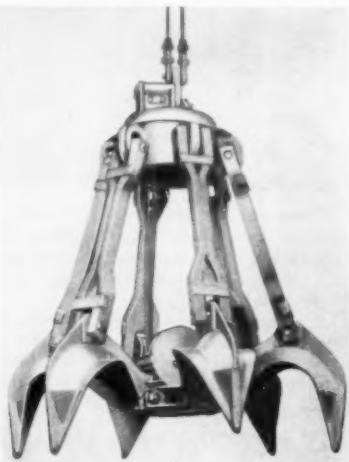
crease belt power by as much as 30%. This pulley is unique in that its design prevents packing of concrete.

The 12-40 Con-Vay-It concrete special conveyor unit can be equipped with a High-Boy elevating device and complete assemblies, permitting side-wise movement when pouring forms.

For more information circle 123 on Service Coupon Page 16 and mail now.

5-8 Tine Grapple

The new Model M-1 grapple, announced by Ruhr Industries, 1461 Walnut St., Philadelphia 2, Pa., has five, six or eight tines, depending on the size of the grapple. Each tine is independent of each other and is positively activated to wriggle and dig deep into object or material. Final resistance is met with a grip of up to 50 tons—five times the weight of the grapple. The grapple is available in sizes from 0.33 to 3.3 cu. yd.



Model M-1 Grapple

For more information circle 124 on Service Coupon Page 16 and mail now.

Trailer Features Level Deck

A front and rear loading folding gooseneck trailer with a level deck has been included as a standard model in the heavy duty trailer line of Martin Machine Co., Kewanee, Ill.

The level deck feature is stated to permit more useable platform area, shorter overall length and reduces weight approximately 800 lb. as compared to the drop deck model. Designated as the RFTL series, this trailer is available in



Onan Model SDRP mounted on trailer with extension lighting standard.



Series 3DSP, 3,000 watts, single-cylinder.

Series 5DRP, 5,000 watts, two-cylinder, opposed.

Cut lighting costs with Onan portable air-cooled Diesel Electric Plants

Make substantial savings on any job where extensive night-lighting is necessary by using Onan Diesel-driven electric plants. Diesel fuel has a big edge in economy and it's readily available on job sites. Onan Diesel plants are built for rugged service, with extra-large bearing surfaces, Stellite exhaust valve seats and other long life features. Engine and generator are direct-connected ... no belts or couplings. Air-cooling eliminates trouble from freezing or leaking coolants. Compact and light weight. Put an Onan Diesel Plant on your next job and check the savings.

Diesel Plants—3,000 and 5,000 watts.
Gasoline Plants—500 to 50,000 watts.

Write for folder



D. W. ONAN & SONS INC.

3778 University Ave. S.E., Minneapolis 14, Minnesota

... for more details circle 234, page 16

four models with capacities of 20, 27, 32 and 40-tons.

With the folding gooseneck lowered, equipment is driven directly on to the platform—no need for ramps or blocking. The winch equipped truck tractor lifts the folding gooseneck into towing position. One man can handle the entire operation in 5 minutes.

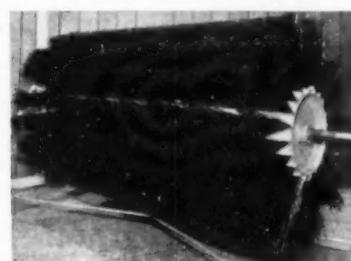


RFTL series Trailer

For more information circle 125 on Service Coupon Page 16 and mail now.

Pick-Up Broom

A new pick-up broom for street sweepers has been introduced by Rynal Corporation, 114 St. Joseph St., Arcadia, Calif. Using Rynal filament, this broom was tested in over 9,000 miles of sweeping in cities across the nation. Users are stated to report cleaner sweeping and up to 10 times the sweeping mileage of Palmyra stalks under similar conditions. Shipped in a carton less than 1 ft. square and as long as the broom, Rynal brooms eliminate the need for large storage areas, coiling equipment, and extra cores.



Rynal Pick-Up Broom

For more information circle 126 on Service Coupon Page 16 and mail now.

85 cfm Portable Rotary Compressor

A new 85 cfm size has been added to the line of Gyro-Flo compressors of Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

The Gyro-Flo 85 weighs 1840 lb. ready-to-go, fully equipped with tool boxes, fenders and two-wheel spring-mounted running gear. As a truck-mounted unit, the Gyro-Flo 85 weighs 1375 lb. and stands 42 in. high.

The new size is driven by the Continental Motors F-140 gasoline engine—a rugged 4-cycle engine with "L" head design and exclusive individual porting. The F-140 is equipped with push button starting and ease of starting under all types of conditions is assured by a heavy-duty 6-volt battery system.

For more information circle 127 on Service Coupon Page 16 and mail now.



Morauer & Hartzell, Inc., Washington, D. C., used Waukesha Diesel powered Lorain shovels on New York Thru-Way.

... and big jobs everywhere with

WAUKESHA

Diesels

easy to start

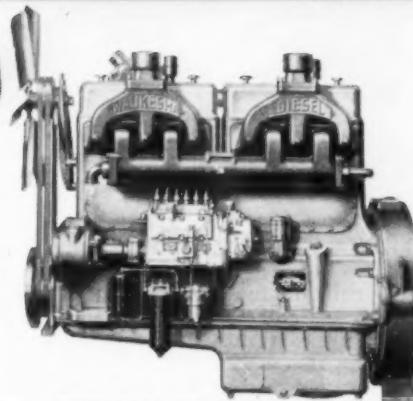
quick to warm up

snappy acceleration

big reserve of power

high fuel economy

most economical upkeep



WAKD Series DIESEL—6-cyl., 6 1/4-in. x 6 1/2-in., 1197 cubic inch displacement.

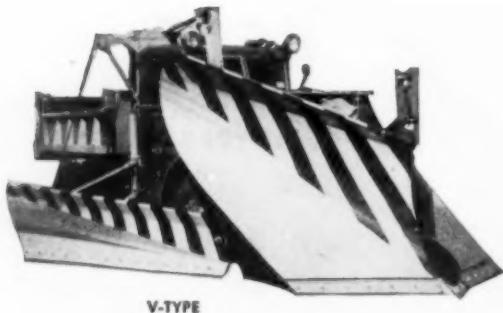
• Diesels for super duty—that keep on putting out the power!

Patented Waukesha combustion chamber controls combustion to meet the needs of the job. • Advanced design features include hardened 7-bearing crankshaft...torsional vibration dampener...heavy-duty aluminum alloy pistons, oil cooled, with chrome plated top piston rings...special alloy wet cylinder sleeves...Stellite faced valves and valve seat inserts...built-in oil cooler...thermostatic water temperature control. Send for Bulletin 1415.

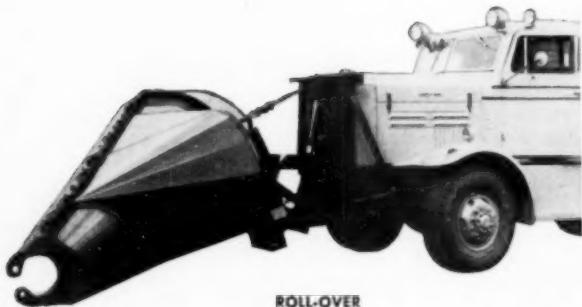
WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN
NEW YORK • TULSA • LOS ANGELES



... for more details circle 264, page 16



V-TYPE

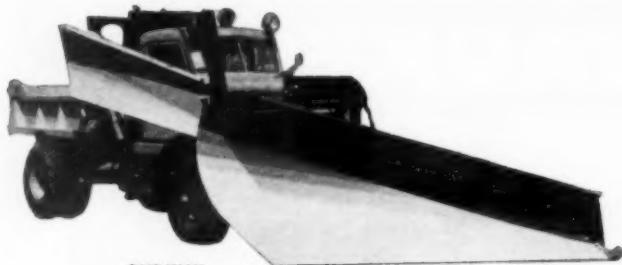


ROLL-OVER

FRINK

The Standard of the Industry... for 35 Years

Every important Snow Plow improvement has originated at FRINK'S



ONE-WAY



POWER REVERSIBLE

FRINK V-TYPE SNO-PLOWS have long been the standard in heavy duty plowing. This model has been continually improved and refined as a result of Frink's continuous engineering research to make better plows. As a result, Frink V-Type Sno-Plows are SELF-BALLASTING; they PUSH EASIER; BEVEL SIDE BANKS; and there is NO SIDE THRUST.

THE ONLY ROLL-OVER. Taper Blade developed by any manufacturer. Hydraulically rotates from left hand to right hand plowing position in 15 seconds. This rugged plow has been very successfully used — particularly on dual super highways and airports. *Eliminates deadheading. Easier to Park.*

THE "400 SERIES" ONE-WAY Trip Blade Sno-Plows combine all the desirable features that place them

ahead of the field in performance and efficiency. They are the finest speed plows manufactured. The mold-board has the taper and curvature which makes the throwing and spreading qualities better than any other one-way snow plow, yet at slow speeds these Frinks neatly windrow the snow.

THE FRINK POWER REVERSIBLE is the most recent completely redesigned Sno-Plow of the Frink line. It is the all purpose plow — plows to the left, to the right, or bulldozes straight ahead — all positions automatically set by means of one convenient cab lever even while plowing. The reversible plows city streets, expressways — cleans up intersections, parking lots, airport ramps and public areas. It is THE all purpose plow.



Clayton, 1000 Islands, N. Y., Frink Sno-Plows of Canada, Ltd., Toronto, Ontario

... for more details circle 208, page 16

MORE YARDAGE on any job



more yards per load... more loads per hour

DIG MORE Powerful pry-out action and 40° bucket tip-back at ground level get full bucket loads with less spillage loss. Power-transfer differentials provide sure-footed traction for digging power.

CARRY MORE Bucket carry position is close and low for maximum stability. Hydraulic system shock absorber cushions loaded bucket—smoothes the ride—permits higher carrying speeds with less spillage.

DELIVER MORE Since you get MORE to begin with and keep MORE while traveling at higher speeds . . . with less spillage in both instances . . . the result—you deliver more yards per load and more loads per hour.

Now you have a choice of three sizes of 4-wheel-drive "PAYLOADER" tractor-shovels, each with all the more-productive features pioneered and proven by The Frank G. Hough Co.

They have power-transfer differentials—an exclusive "PAYLOADER" tractor-shovel feature that maintains effective traction on mud, gravel, ice and snow.

They have "no-stop" power-shift transmissions and torque converters . . . planetary final drives . . . power-steering and 4-wheel power brakes.

They have the exclusive bucket motion with 40° bucket tip-back at ground level and powerful pry-out action.

For proof of their superior performance and greater productive capacity on your job, ask your "PAYLOADER" distributor for a demonstration.

THE FRANK G. HOUGH CO. 3
768 Sunnyside Ave., Libertyville, Ill.

Send full data on 4-wheel-drive "PAYLOADER" tractor-shovels.

- model HO 2½ yd. payload; 1¾ yd. struck
 model HH 1¾ yd. payload; 1½ yd. struck
 model HU 1½ yd. payload; 1 yd. struck

NAME _____

TITLE _____

COMPANY _____

STREET _____

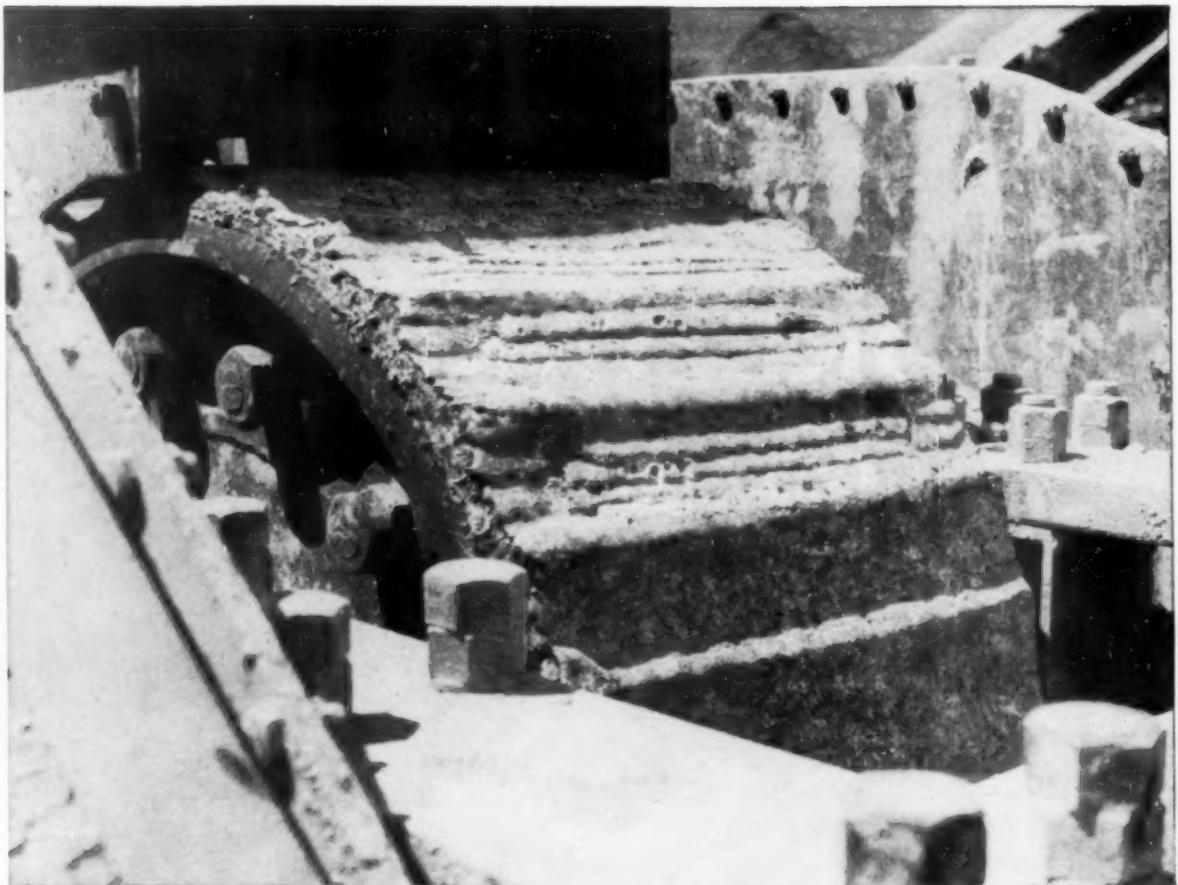
CITY _____

STATE _____



PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO., LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY





Since their last major rebuilding, this 18" x 30" Pioneer roll crusher has produced 30,000 tons of aggregate. Twice-a-week touch-ups with Stoody 100 hold wear to a minimum.

STOODY SEMI-AUTOMATIC HARD-FACING helps maintain road schedule in HIGH SIERRAS

A new 16½ mile State Highway between Shaver Lake and Huntington Lake in the high Sierras was recently completed by Phoenix Construction Co. of Bakersfield, California. One interesting feature of the job was the preparation of aggregate which was supplied by portable crushers operating near the site. Material used was quarried blue granite. Primary reduction was effected by jaw crushers followed by a final roll crushing operation. 210,000 tons of aggregate were required, as well as production of sand from the same material. Crusher rolls consequently suffered considerable wear.

The crusher corrugations were

completely rebuilt with Stoody Manganese, spacing about 3" peak-to-peak. These were overlaid with Stoody 100 applied with the semi-

automatic welder. Wear was never permitted to reach the manganese shell thereafter. During shut-downs, corrugations were retouched with Stoody 100, as required, restoring full efficiency for the following shifts.

Hard-facing methods for most successfully maintaining all your wearing equipment are fully described in the Stoody Guidebook and folder covering semi-automatic procedures. Ask your Stoody dealer for a copy (see the "Yellow Pages" of your phone book) or write direct.



Facilitating maintenance work is this portable semi-automatic welding machine. Quickly hauled to the site, it is dismounted from the truck for use.

STOODY COMPANY

11925 East Slauson Avenue

Whittier, California

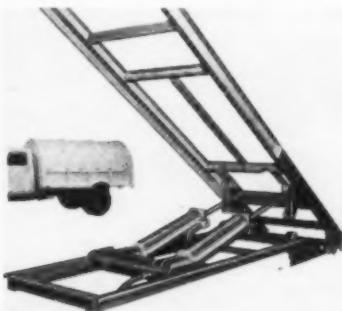
... for more details circle 252, page 16

Low Mount Hydraulic Hoist

A new low mount hydraulic hoist, with all components located within the compact 6½ in. mounting height of the hoist frame, has been announced by the Marion Metal Products Co., Marion, O.

Mounting ease is the big feature claimed for this new Marion 6625 hoist, designed for use under garbage, trash and rubbish pickup truck bodies with wheel housings.

Employing a modified double arm type action, the new 6625 starts as a double arm lift and changes to direct lift at mid-point in the lifting cycle. A new type arm mechanism converts the hori-



Model 6625 Low Mount Hoist. Insert shows a Refuse Hauler, a typical installation for this Hoist

zontal thrust of the cylinders into a form of vertical thrust.

For more information circle 128 on Service Coupon Page 16 and mail now.

35-Ton Lorain Moto-Crane

A 35-ton Moto-Crane, model MC530W, has been added to the Lorain line of power shovels and cranes, of the Thew Shovel Co., Lorain, O.

The rubber-tire carrier for this new model is of entirely new design and is longer (28 ft. 6 in.), heavier and stronger. It is 122 in. wide. It is powered by either gasoline or diesel engines through either of the 10 or 15 speed transmission sets available. Highway speeds up to 37 mph are possible. Can be supplied with 6 x 6, 6 x 4 or 8 x 4 axle arrangements. The 8 x 4 carried permits greater lifting capacities without the use of outriggers



Lorain Model MC530W Moto-Crane

and the double front axle gives better load distribution for improved flotation for off the road travel. Tires are 14:00 x 20. Hydraulic, power-assist steering is standard. Power brakes are available.

The new Lorain "Shear-Ball" mounting is provided for mounting the turntable to the carrier. This mounting eliminates all adjustment and maintenance of center pins, center pin nuts, and top or bottom rollers. Reduces lubrication need. Seals out dirt and mud. The 3-position turntable mounting plate on the carrier bed allows turntable position to be adjusted for digging ranges of various front end equipment or for maximum crane capacities.

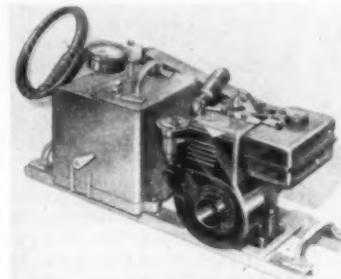
This new Moto-Crane is fully convertible to crane, clam, dragline or hoe. Hoe boom is 19 ft. long—stick 7 ft. 48 in. bucket is standard. 46 in., 44 in., 40 in. and 36 in. buckets are available; 8 ft. stick available for all but 48 in. bucket.

For more information circle 129 on Service Coupon Page 16 and mail now.

Gasoline Powered Hydraulic Pump

A new gasoline powered hydraulic pump, announced by the Owatonna Tool Co., 435 Cedar St., Owatonna, Minn., is designed for use in areas where electric power is not available to meet the demands for high speed continuous hydraulic flow which hand pumps cannot deliver.

Powered by a Briggs & Stratton gasoline engine, the new OTC pump will develop a maximum pressure of 10,000



Gasoline Powered OTC Hydraulic Pump

psi for intermittent service and 6,000 psi for continuous service. It will deliver 19.25 cu. in. of oil per minute for 500 rpm and is equipped with built-in overload valve for protection of pump ram and personnel. The Briggs & Stratton model 6-R6, 4 cycle air cooled engine has a built-in 6 to 1 gear reduction and will develop 2 hp at 600 rpm.

For more information circle 130 on Service Coupon Page 16 and mail now.

Huber-Warco Offers Choice of Diesels

Huber-Warco Co., Marion O., has announced the addition of Cummins diesel powered units to its line of 6-D and 7-D series motor graders with torque converter and full power shift transmission.

The new models are the 6-D2, pow-



Huber-Warco Motor Grader

ered by a 125 hp JN-6-BI Cummins, and the 7-D2, powered by a 150 hp JBIS-600 Cummins diesel. The 6-D2 and 7-D2 are similar in design to the 6-D and 7-D which carry GM diesels.

As with the 6-D and 7-D, the 6-D2 and 7-D2 feature Huber-Warco's combination of a torque converter, and full power shift transmission stated to yield important advantages. These include more usable power, increased ease of operation and positive protection for all machinery. Also, the combination provides greater workload capacity and greater variations in torque output with only four forward and four reverse speeds.

The power shift transmission, itself, permits quick shifts under full load at wide-open throttle without interrupting power flow from the engine to the load.

Also standard on both grader models is a power sliding moldboard, operated hydraulically from the cab. It allows an operator to power-shift the moldboard out of the way as he approaches a culvert or post and then power-shift it back to its exact former position—all without leaving the cab or slowing his progress.

For more information circle 131 on Service Coupon Page 16 and mail now.

Goose Neck Crane Attachment

A new 15-ft. goose-neck crane attachment, featuring low clearance for in-plant and yard materials handling, has been announced by the Schield Bantam Co., Waverly, Ia. The new attachment features a minimum working clearance height of 10-ft. 5-in. when mounted on the self-propelled Model CR-35 Bantam, for which it was designed. Working radius at this clearance height is 17 ft. 6 in., and travel-with load crane capacity is listed as 4,675 lb.

The new attachment is a specially constructed 15 ft. box boom, with the center line of the top section off-set by 25 degrees with respect to the bottom section by inserting a wedge with an angle of 25 degrees. The wedge is held in place by 24 heat treated cap-screws, and is easily removed to convert to straight boom operation.

The bottom section is 8-ft. 11¾-in. long (pin to frame) and the top section is 7-ft. ¾ in. long (frame to sheave). The distance between the boom foot pin and the center line of the boom tip sheave is 15-ft. 2¾-in.

Look at These Outstanding Features of the Pettibone Wood SPEED MIXER



ONE ENGINE FOR ALL POWER

The preferred high-pressure by-pass binder injection system of the big Pettibone Wood Roadmixers is used in the Speed Mixer. This system operates from the same engine which provides power for the rotor and traction. *The binder flow is controlled by a valve and is not dependent upon the engine RPM.* This system permits synchronizing travel speed and mixing, thus simplifying the entire operation and reducing maintenance and fuel costs.

POSITIVE DUAL-CHAIN DRIVE

The rotor shaft is chain-driven from both ends—not center driven—resulting in positive drive and stable, balanced power. This produces a uniform mix all the way across the rotor.

CLEAR, HEAVY-DUTY ROTOR

There are no mechanical obstructions on the rotor, constructed with fewer moving parts for heavy-duty, uniform mixing, blending and pulverizing. Shear couplings prevent rotor damage. There are no rotor clutches to wear out!

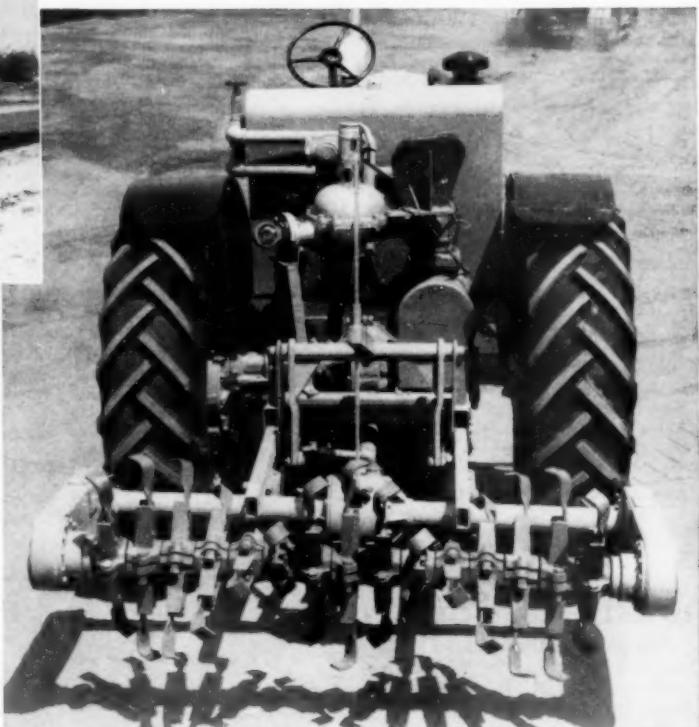
ONLY 30 HEAVY-DUTY TINES

30 heavy-duty tines do all the work. The advantages are obvious—less maintenance, easier replacement, thorough mixing without jam-ups. You would expect the simplest and most effective design from the originators of mix-in-place road-building equipment.

DESIGNED BY CONTRACTORS

The Speed Mixer incorporates specific features requested by contractors. Not a "compromise" piece of equipment, the Speed Mixer was designed to do the job in the simplest way with the least operating and maintenance cost.

...THE COMPLETE TRAVELING
MIXING PLANT THAT MIXES,
BLENDERS AND PULVERIZES



The Speed Mixer is the answer to more economical, speedier construction and reclamation of farm-to-market and access roads, highways, streets, airports and parking lots. In a modest-cost unit, the Speed Mixer incorporates all of the proved features of travel-plant mixing, plus pulverizing, blending and material processing from the quarter-century of Pettibone Wood experience in pioneering big-capacity mix-in-place equipment for soil-cement and bituminous stabilization.

The Speed Mixer *pulverizes* hard soils, adobes, clays and light bituminous mats to aggregate size ready for in-place mixing—*blends* existing soils or combinations with imported aggregates into a thorough, uniform mix—*mixes* all aggregates with all binders, soil-cement or bituminous.

When you see the Speed Mixer in operation, you will agree that no other equipment equals it in performance and maintenance cost. Ask for a demonstration, without obligation!

**Write for FREE
Booklet on ABC's
of Soil-Cement
Stabilization**

Describes the cost-saving subgrade building method that assures longer surface life for highways, roads, streets, parking lots and airports.

PETTIBONE WOOD MFG. CO.

Originators of Mix-in-Place Roadbuilding Equipment

6900 Tujunga Avenue, P.O. Box 620, STanley 7-3281

North Hollywood, California

Subsidiary of PETTIBONE MULLIKEN CORP., CHICAGO 51, ILLINOIS

... for more details circle 237, page 16

ROADS AND STREETS, November, 1956

Higher Lift for Michigan Tractor Shovels

Gondolas and high sided trucks can now be loaded directly by Michigan tractor shovels fitted with a new high-lift bucket. Designed by the Construction Machinery Division of Clark Equipment Co., Benton Harbor, Mich., for its Michigan Model 175A tractor shovel, the new attachment increases dumping height of the bucket by 3 ft., 7 in. It raises the lower edge of the bucket to 12 ft., 1 in.

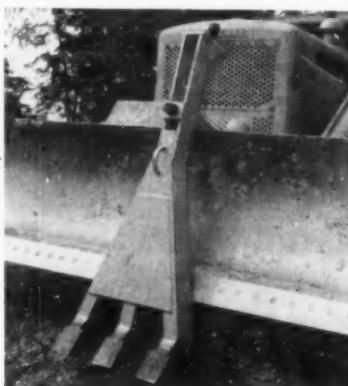


Model 175A with new High Lift Bucket

For more information circle 133 on Service Coupon Page 16 and mail now.

Stumper Attachment for Bulldozers

A new stumper, the Ransome Model R100, has been introduced by the Ransome Corporation, 2729 Hunting Park Ave., Philadelphia 29, Pa.



Ransome Model R100 Stumper

The new three prong stumper can be attached to any bulldozer blade from 35 in. to 51 in. in height. The Model R100 features a positive clamping device which permits its being mounted or dismounted in a matter of minutes, freeing the bulldozer for gathering stumps. No alterations to the bulldozer blade are required. The stumper has replaceable manganese teeth.

For more information circle 134 on Service Coupon Page 16 and mail now.

Automatic Recorder for Soil Tests

Accurate, permanent records of time-settlement data from soil consolidation tests can be made automatically with the new K-W Autocon Recorder introduced by the Tinus Olsen Testing Machine Co., 5664 Easton Road, Willow Grove, Penn.

For more information circle 135 on Service Coupon Page 16 and mail now.



You take 14 men and what do you get?

In 1914 when this first Rogers commercial trailer was built, 14 men constituted an appropriate load test.

42 years later it is still an "iron bound" Rogers policy to load test their vastly improved current models under actual hauling conditions.

TESTING?

1 - 2 - 3 - 4 - 5
6 - 7 - 8
9 - 10 - 11
12 - 13 - 14

A cartoon illustration of a pack mule named "PACKY". The mule is shown rearing up on its hind legs, with one front leg kicked out. It has a determined expression and is holding a small sign that says "PACKY *".

You'll find a liberal safety factor in every Rogers Low-Bed Heavy Duty Trailer today.

*Introducing "PACKY" the pack mule, the traditional load carrier in the old "four legged" field. He is a natural kibitzer and sometimes envious commentator. We'll have to contend with him for a while at least, unless he lets his mulish traits get the better of him.



ROGERS LOW BED - HEAVY DUTY TRAILERS

ROGERS BROS. CORP. ALBION, PENNA.

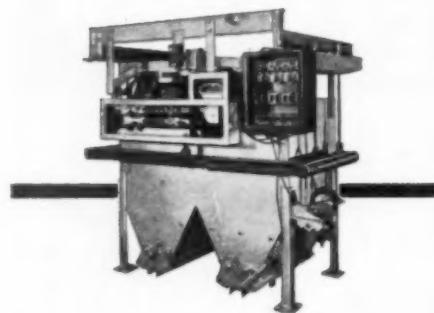
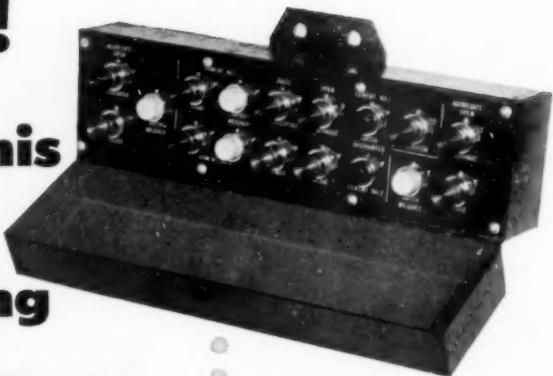
Export Office: 50 CHURCH ST., NEW YORK 7, N.Y., U.S.A. Cable Address: Brosites

... for more details circle 242, page 16

Roadbuilders!

Just this  Plus this

Do **ALL** your batching



MORAL: The BUTLER 0-1-0's labor saving, high production and remarkable portability cut your costs so sharply, you can bid any job successfully and make a better profit against any competition (except another 0-1-0 owner).



As your first step toward BUTLER 0-1-0 ownership send for this illustrated Bulletin completely describing the advantages. Get ready — now. Send for Bulletin 0-1-0 today.



completely interlocked, cannot discharge until correct weights are in the hopper and the batcher cannot be charged until the previous batch is cleared. Every batch is the same . . . no errors, no slow down through operator fatigue.

BUTLER BIN COMPANY

959 BLACKSTONE AVENUE

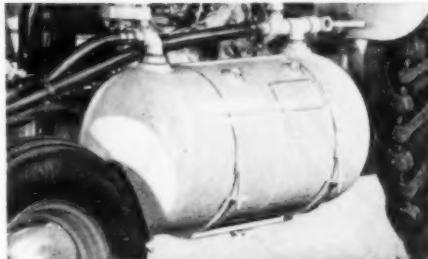
WAUKESHA, WISCONSIN

. . . for more details circle 192, page 16
ROADS AND STREETS, November, 1956

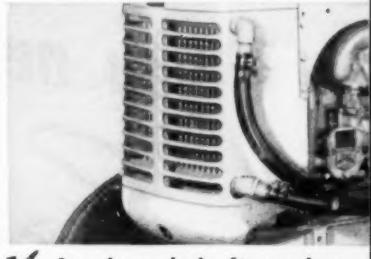
Check These Points Thoroughly before buying a combination Tractor-Compressor

Absence of these engineering design features can mean less work done and more cost on your next job.

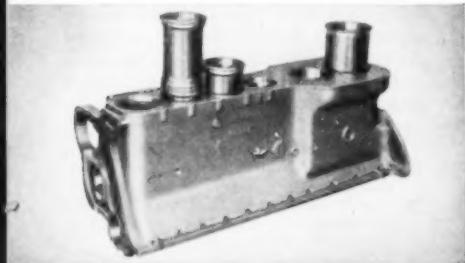
In recent years, combination tractor-compressor units have been increasingly popular. This is due, in large measure, to the fact that machines of this type are much easier to keep at work all day than their counterparts: an ordinary tractor and a standard portable compressor. To insure that you get the maximum benefit from any combination tractor-compressor unit, check these important points before buying.



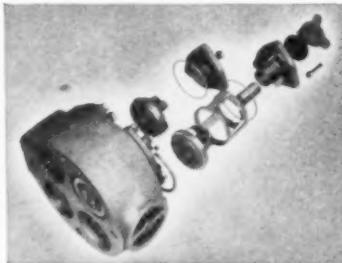
✓ **Location of the compressor air receiver** is important. The air receiver must be exposed to give you cool outside air in every operating condition, and should not hug the hot engine or be located next to the gas tank.



✓ An air-cooled aftercooler permits the tractor-compressor to deliver clean, cool, dry air hour after hour. Best cooling results can not be obtained from those units using a water-cooled manifold as an aftercooler.



✓ **Replaceable wet sleeves** in the cylinder construction of your tractor-compressor eliminate costly reborning jobs, and give you more efficient cooling by directing a 360-degree flow of water around each individual cylinder.



✓ **Interchangeable and replaceable compressor valves** let you get longer service life from your tractor-compressor. This feature also lowers your maintenance costs and assures top performance.



✓ **Plenty of operating space** is important, too. Be sure that your tractor-compressor permits the operator to drive and work efficiently and safely. He should be able to stand up while operating the unit.



✓ **Wrap-around fenders are a must.** This is a major safety factor, particularly when the tractor is operating on rough ground or on highways and streets.



✓ **Many attachments for use with the unit** give you greater job versatility. Be sure your machine is designed for use with attachments such as the front-end loader, backhoe, and other tools.

✓ **A hood that is easily and quickly removable** helps reduce the time needed for minor repairs on your tractor-compressor. It permits preventive maintenance practices, too. Ask for this feature.

✓ **The fastest possible travelling speed** is a time-saving feature of the tractor-compressor. Be sure that your unit can get you from job to job in the shortest possible time.



✓ **If it's built and designed by one manufacturer** as a complete unit, you can be sure of maximum performance. Make sure that the tractor is designed to "work" with the compressor unit and is not an ordinary industrial tractor. The engine, too, should be a product of the manufacturer offering the unit. Your unit should "belong together."

These features can be found only in the Le Roi Tractair — a combination 42-hp wheel tractor and a 125-cfm air compressor. Be sure you get all the savings in time and money that the engineering design of Tractair offers you. Check before you buy.



LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

... for more details circle 227, page 16

Why buy more
machine than
you need?



There are many $\frac{3}{4}$ -yd. shovel-cranes on the market. Some are "light weight"—at a price. Some are "heavy-duty," deluxe, more costly. The Lorain-25A is neither. It is a true, full-value, $\frac{3}{4}$ -yd. general-purpose machine that will surprise and satisfy you with its ability to handle a wide range of tough jobs. It is an all-around, fast, serviceable machine—not over-priced, not over-engineered, but containing many quality features that give you plenty of pep and power, plenty of long-life endurance.

If you want a real $\frac{3}{4}$ -yd. machine that will handle all of your day-to-day requirements with ease and still have enough "stuff" to handle your occasional "extra tough" jobs—the Lorain-25A is your machine. You don't have to pay the deluxe, heavy-duty price to get most of the big-machine features. You don't have to buy more machine than you really need to get the design and quality construction you know you must



have to get long life, profitable operation.

Feature for feature—value for value—dollar for dollar—you'll find the Lorain-25A gives you the most for your money in the general-purpose $\frac{3}{4}$ -yd. class. It is available as a $\frac{3}{4}$ -yd. shovel—as a hoe with 16' and 19' boom, with 30" or 40" dippers, or as a dragline, clamshell or crane. You owe it to yourself to check the "25A" in operation. Call your Thew-Lorain Distributor and ask him for a job-visit demonstration!

THE THEW SHOVEL CO.
LORAIN, OHIO, U.S.A.

THE **$\frac{3}{4}$ -YD.
LORAIN
25A**
gets your job done
and
makes you money!



EVERY DAY . . . these "25A" features make money

Here are important features that pay dividends the minute your operator takes over the control of a Lorain-25A. They mean easier operation, faster cycles, reduced operator fatigue, higher production. Ask your operator to check them, too.

- Big, 18" swing clutches—20% larger, fewer adjustments, longer life
- "E-Z" operating controls—effortless action, fast response
- "Hydra-Ease" control of crawler steering, tread lock, house lock and shifting of swing-travel jaw clutches
- 2 crawler speeds in both directions
- 12' 6" crawler—stable, no "nosing-in"
- 4-way position tread and travel lock, hydraulically operated
- Independent travel available, a big advantage on dragline and hoe operations
- New, square-tubular-chord clamshell and dragline boom—lighter, stronger; greater lifting capacities; greater bucket operating ranges
- Steel shell lagging for bigger cable on drag-in drum
- Power load lowering is standard



OVER MANY YEARS . . . these features mean long life

Consider these features in terms of a long-term investment—features that keep your Lorain on the job more hours over more years.

- One-piece, all-welded, truss-reinforced, rigid turntable bed—assures lifetime alignment of mechanism
- 19 anti-friction bearings on clutch shaft
- Hoist drums on anti-friction bearings
- Oil-enclosed cut gears on turntable
- Oil-enclosed crawler travel mechanism
- Dragline fairlead sheaves on anti-friction bearings
- Sealed idler rollers on anti-friction bearings available for crawler
- Treads with replaceable tread pin bushings available for crawler
- Choice of 22" or 29" crawler treads
- Fully convertible to shovel, crane, clamshell, dragline or hoe—extra job and profit possibilities
- Choice of 16' and 19' hoe booms
- Hoe dippers available in 30" to 40" widths

. . . for more details circle 258, page 16

THE W **LORAIN**

Bituminous ROADS AND STREETS



Putting finish evenness on asphaltic concrete for relocation of U.S. 26 around Palisades Dam, in eastern Idaho. Buffalo-Springfield 3-axle roller. Contractor is Holmes Construction Co., of Heyburn, Idaho, contractor.

Published by Gillette Publishing Company,
22 West Maple Street, Chicago 10, Illinois

Plant Control of Bituminous Concrete Mixes

NOVEMBER 1956

WHO



the ARBA ROAD SHOW

and CONVENTION

Exhibits

Whatever your interests, you'll find the equipment, materials and supplies you use on display. New models, new methods and current machines are exhibited.



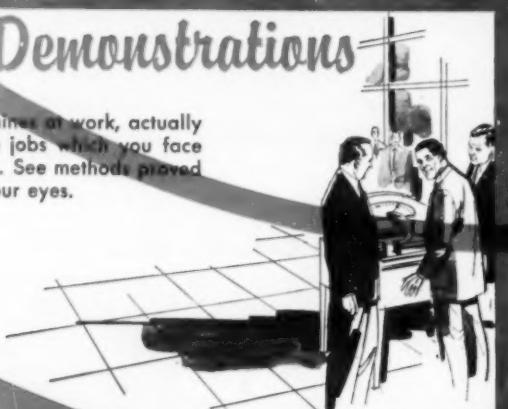
Discussions

Hear internationally-known authorities report on the latest advancements in construction—lead discussions about new ideas—present details of the huge vital road program.



Demonstrations

See machines at work, actually doing the jobs which you face each day. See methods proved before your eyes.



Get-togethers

The contacts you make will prove of inestimable value. Experts from every part of the world—every one ready to talk about your problems.



YOU'LL SEE THERE!

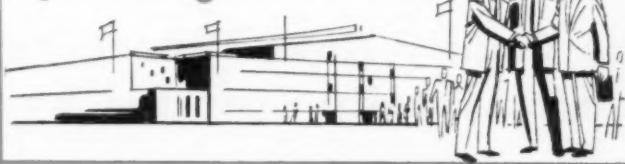
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 CORPORATION
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 THE EIMCO CORPORATION
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ELECTRIC WHEEL COMPANY
 ERIE-STRAYER COMPANY
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 EUCLID DIVISION
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 FISKE BROTHERS REFINING CO.
 FORD MOTOR CO.
 FRUEHAUF TRAILER COMPANY
 FULLER MANUFACTURING CO.
 THE GALION IRON WORKS & MFG. CO.
 GAR WOOD INDUSTRIES, INCORPORATED
 GENERAL ROAD MACHINES, INC.
 GILSON BROTHERS COMPANY
 GMC TRUCK & COACH DIVISION
 GENERAL MOTORS CORPORATION
 GOOD ROADS MACHINERY CORPORATION
 DETROIT DIESEL ENGINE
 DIVISION GENERAL MOTORS CORP.

THE GORMAN-RUPP CO.
 W. E. GRACE MFG. CO.
 THE HANSON CLUTCH & MACHINERY CO.
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... for more details circle 182, page 16





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. . . for more details circle 204, page 16

ROADS AND STREETS, November, 1956

VIEWS AND COMMENTS

By H. G. Nevitt

THE CHANGING OBJECTIVE

BITUMINOUS design and construction have been progressing rapidly. The engineers concerned have concentrated on the development of better methods, to the point where some are losing sight of the fact that the objectives have likewise been changing. This is often true of men so active in a certain field that they fail to keep their perspective. We think the matter has enough implications to justify discussion.

Historically, low cost bituminous construction can be divided into three phases. We exclude from this review high type plant mix, which in the early days was an extremely empirical but surprisingly well engineered operation. In fact, this precision was necessary, as it was likewise a costly approach and restricted therefore mainly to city use where high traffic or other requirements justified the expense.

In the early days of bituminous highway paving, the primary objective was to get a bituminous mat which would last long enough to give some service. Many of them gave little trouble; nevertheless, it was taken for granted that the usual mat would have to be remixed or otherwise given elaborate maintenance after the first year or two. This was so much the situation that we recall one state's attempting to design its mats primarily on the basis that they could be easily reworked. The use of cutbacks was often rejected for this reason; and in general the attitude taken was that the surface was merely a temporary one, though susceptible to continued building up through later construction.

As our knowledge in this field developed, it began to be apparent that relatively permanent mats could be built. By this we mean mats which would require maintenance but would not go to pieces in a year or two, and did not require designing on the assumption that reconstruction was almost inevitable. This is the usual status today, but in some states we have passed into a third phase.

With this group it is taken for granted that our knowledge makes possible the construction of mats which will not fail; hence the emphasis has changed to building them for maximum economy. This economy results from both a lower first cost and lower maintenance. In this stage of thinking, the mere fact that a mat may last a number of years under maintenance, or gives excellent service and requires little attention, is not considered sufficient. It is the original cost and the maintenance requirements for the probable life of the pavement which are critically viewed, and the effort is to hold this total over-all cost to a minimum.

Out of First Stage

This country is practically out of the first stage everywhere, but a large number of road building agencies are still in the second phase of this development in bituminous construction. We are constantly encountering decisions which are based on the premise that the methods followed have given mats which have not failed in the first few years, therefore must be correct. These engineers do not ignore first cost or maintenance, but their actual analyses of their problems do not scrutinize these factors in detail; and their decisions—which are primarily retention of past methods—are the result of their feeling that their roads are good because they no longer fail.

We hardly need to state that this is a very intangible matter, difficult to put over with those concerned. In fact, we have never seen an engineer whose current objectives could be classed as in the second phase admit it. For, by the time the matter had been thoroughly discussed, his own stimulated thinking processes had moved him into the third phase. The fact remains, however, that many design and construction procedures do not give true or full consideration to the economic factors but instead reflect complacency based on the abil-

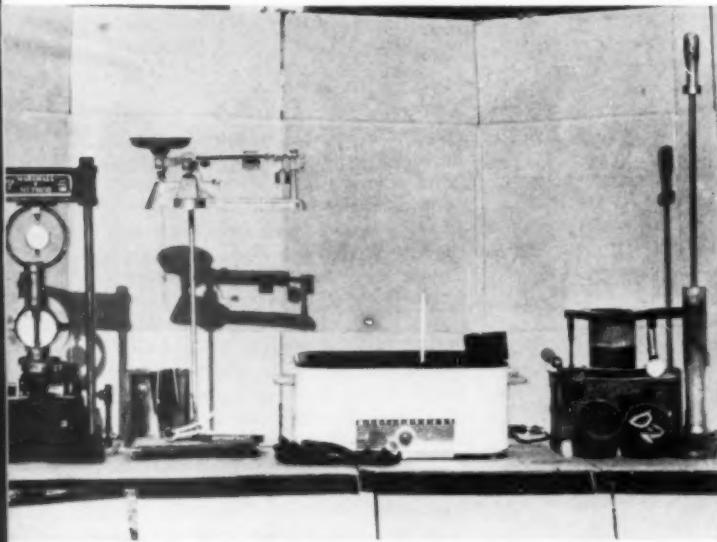
ity in relatively recent years to build roads which stand up remarkably well, at least throughout their early life.

The question may be properly asked as to what differences in procedures will result from this change in point of view. The answer is that surprisingly many will ultimately appear. Improvements in economics are rarely the result of spectacular changes. They instead come from the accumulated effects of many minor improvements. But all of these added together make a remarkable showing. When our engineers are no longer satisfied to design merely on the basis of surface survival but are alert to every factor which may reduce first cost or eventual maintenance charges, we will have many changes in our techniques. Most of these will likewise be minor, but the total effect as noted above will be considerable.

What are some of the fields which will be influenced by this change of attitude? First will be the matter of soil stabilization and other better use of local or cheap materials. This objective receives much lip service today, but the actual accomplishments are far less than the possibilities. Likewise we will give more exact attention to problems such as stripping, absorption, asphalt grade, and similar. Today they are viewed from a do-or-don't basis. Instead, our use of low cost aggregates which do not suffer enough from these disabilities to warrant rejection will be such as to minimize the extra maintenance which they are likely to cause. The relationships between these defects and extra maintenance from them, as distinguished from failure, is a field to which a great number of bituminous engineers have given little attention.

Summing up, we can safely say that the objectives of bituminous design are entering a new era. Methods which simply build roads good enough to last awhile, the retention of approaches which really don't permit real engineering of the job but get by with experienced hands applying them, these are no longer enough. We need greater completeness and precision in our techniques because the upkeep savings that result are so great.

Admittedly many design methods throw no real light on this phase but neither do they really design the structure in true engineering fashion; for both reasons they will have to be improved or replaced. Meanwhile, a searching look at every project from this new viewpoint will lead to many savings. Can any other course be justified?



● Marshall equipment for design and control of mix.

Short Course for Airfield Maintenance

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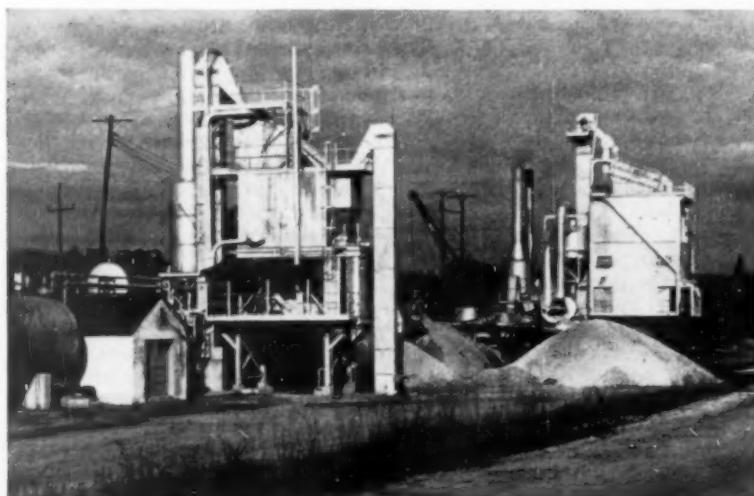
Plant Control of Bituminous Concrete Mixes

By Donald D. Dagler

District Engineer, The Asphalt Institute
Harrisburg, Pennsylvania

Highway and street department engineers, as well as military and civil airfield personnel—and of course superintendents and plant men employed by contractors—can gain from this excellent "refresher course" in asphalt plant fundamentals. While the author obviously refers to slide pictures in his text, the reader does not need to see these slides to get Mr. Dagler's points.

This summary was presented to an audience of military installations leaders as part of the "Conference on Airfield Pavement Maintenance," held by the U.S. Air Force at Colorado Springs, Colo., May 28-31, 1956. A general review of this conference was published in *Roads and Streets*, August, 1956. The Editors.



CONSTRUCTION of an asphaltic concrete pavement of flexible type pavement, requires four major controls to arrive at a good end result.

First, an adequate foundation on which to place your asphaltic concrete, without which no road, regardless of the type of surface, will last.

Second, good design. We feel today that asphaltic concrete methods are such that with other controls, only excellent pavements can result.

Third, good plant control.

Fourth, placing the material under controlled methods.

● Two fully equipped hot asphaltic concrete plants.

It must be remembered that all four of these are necessary for a good asphaltic concrete project. Today, we have time to discuss only one of these controls; namely, plant control.

Here are two plants (slides shown), each of which is equipped to produce hot or cold asphaltic concrete. This producer has two plants so that he may produce hot and cold mixes at the same time to satisfy his customers. You cannot produce hot and cold mixes in the same plant with only one pug-mill. If sufficient bins are available to store aggregates for cold mixes, and the plant is equipped with two pug-mills, one of which is used for hot mixes and the other for cold mixes, then it is possible to operate hot mixes and cold mixes in the same plant by filling the cold bins with aggregates run through the drier at the proper temperature prior to mixing the hot mix and mixing in separate pug-mills.

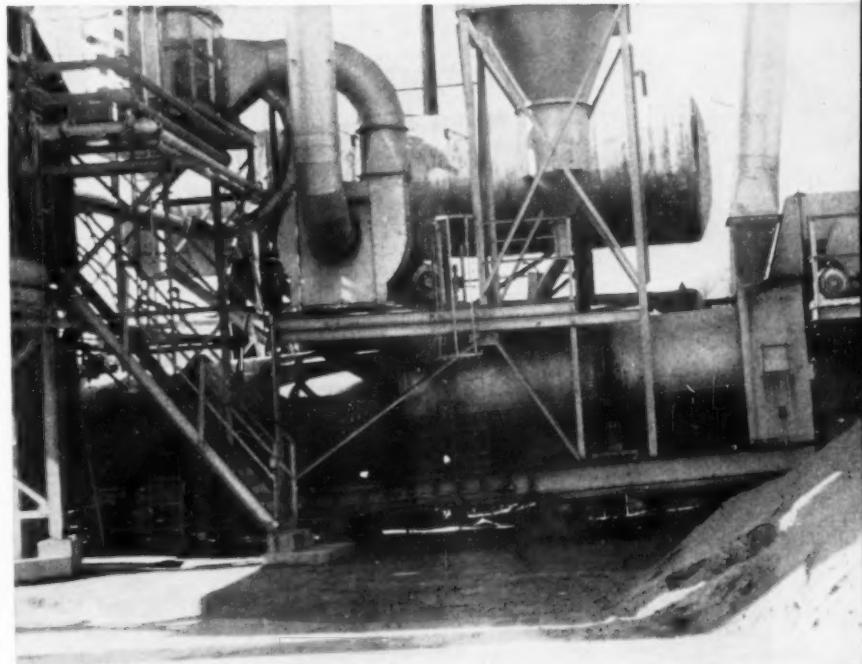
There are two reasons for not mixing hot and cold mixes in the same pug-mill. First, it is a dangerous operation. If you are using a cutback asphalt which is high in naptha content or if the cutback is added at the pug-mill, either is apt to flash if you have just mixed a hot batch. Secondly, if you put a hot batch into the pug-mill directly after a cold batch, you will lose some of the heat in the aggregates, which means a loss of workability at the paver.

We are going to discuss hot mixes, for today about 80% of the mixes produced are hot asphaltic concrete, as we have found over a period of years that hot mixes are more durable.

Asphalt Tanks. It is necessary for you to have two or three asphalt tanks. You may get jobs where it is necessary to use 85 to 100 penetration asphalt, and you will have other jobs involving 60 to 70 penetration, or even sheet asphalts down to 55 to 70 penetration asphalt.

Since trucks have been utilized to transport asphalt from the refinery to the asphalt plant, it is very necessary that these trucks be clean of fuel oil, naptha, kerosene, or such lubricating materials that will cutback the asphalt. Although the refineries try very hard to inspect the trucks before loading, they sometimes miss one.

If an 85 to 100 penetration asphalt is cutback, this means an increase in penetration which will result in a slower set. If the mixed material is compacted before this cutback material has evaporated, the material will continue to move around. So, I would suggest that it is well to have a penetrometer available to check the asphalt being used.



● Drier and dust collecting system.

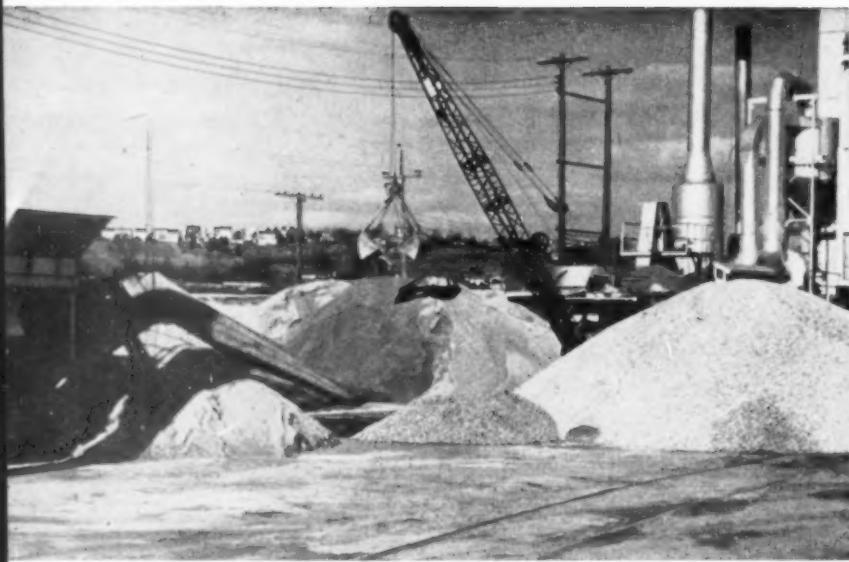
In most asphalt plants today there are return lines from the asphalt tank to the asphalt bucket or meter. Some of the older asphalt plants that have been converted do not have them. For example, here the asphalt comes from the bottom of the tank, goes up and

over to the asphalt bucket or meter, and back on the top line. The reason for this is that in the tank the asphalt circulates continually, and a uniform temperature must be maintained.

As I go along, I am going to point out the importance of temperature in



● Proper way to remove a stockpile by crane.



● The start of improper stockpiling.

hot asphaltic concrete. You might say it is the basis for what happens out on the project, as to whether or not you are going to get good compaction which ultimately ends up in a good project.

● **Plant Stockpiles.** Here we have our old friend, the stockpiles. For the life of me I cannot understand why a quarry operator spends thousands of dollars putting in screens. He screens his aggregate to almost any size he wants, then he takes it out of the bins and puts it on the stockpile. All the coarse material rolls down to the

outside and the fine material stays in the middle.

Then we have a crane operator who starts at the top and goes right down through the middle of the pile. Probably when the designing engineer came out, he took his sample from the outside of the pile. He did not get a representative sample to start with, so he designs it on that basis, let's say. He has a certain surface area on which he is going to add asphalt. The surface area is small because he has coarser particles. So, the crane operator gets down to the middle of the stockpile, and when the mix is made

from this material he does not have enough asphalt to cover it. The result is that the road ravel and tears out.

● **Causes Slippery Pavement.** Or, it can work the other way, and some of the slippery pavements are caused by just this. If the design has been set up on material from the fine part of the stockpile and the crane operator is charging coarse material into the plant, then the surface area is too small for the amount of asphalt and flushing will take place resulting in a slippery pavement.

Stockpiles can be built that will not segregate. That is the secret of any design, whether it is rigid or flexible pavement, because actually all you are doing is taking large aggregate, filling in the voids with smaller size aggregate, and putting some ingredients in there (in this case asphalt) to hold it together. Stockpiles should be built in 4-ft. layers and removed in the same manner.

Stockpile Segregation

This stockpile has not been built up high enough at this point to segregate; however, more material added to it could cause segregation. I am talking about stockpiles that are mostly coned, that somebody makes at the quarry by dropping the aggregate over a bank and all the coarse stone runs down along the side. Yes, there are some cases where the stone can be recombined pretty well, but this crane operator does not know anything about that. Nobody has ever told him.

The result is that unless he is told to move around the surface of the stockpile, and to take it off in layers, as you might say it was put on the pile, he will work instead in one spot. He does not know the effect this will have on the material coming out the other end of the plant. In other words, we are getting back to the old saying of years ago, that it went in one end of the plant white, and came out the other end of the plant black, and that is about all we knew about it.

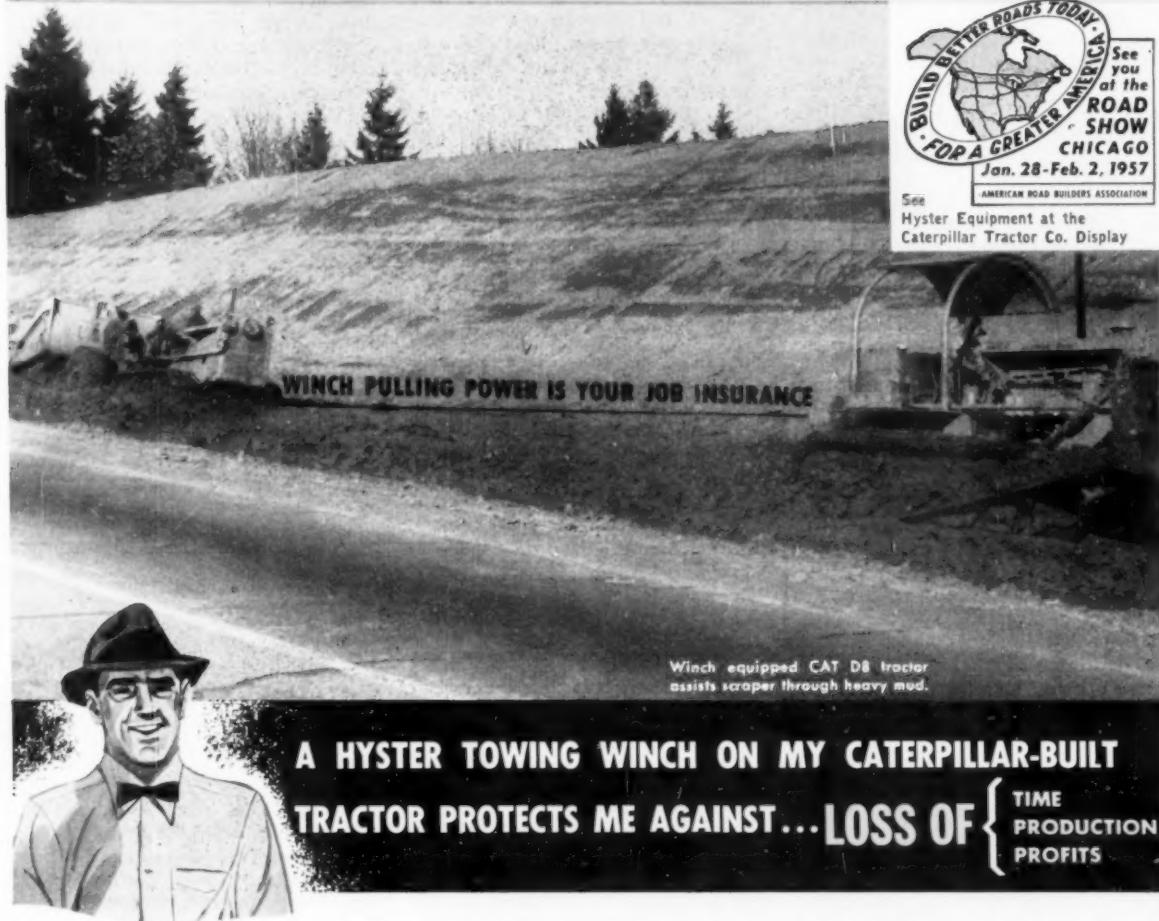
Some agencies have specifications stating that the material at the so-called cold elevator must meet a certain gradation. Others do not seem to bother with gradings at the cold elevator. If the bituminous concrete producer realizes the importance of well graded materials, then it is not necessary for the engineer to worry about cold gradings. Assuming everything else in the plant is working



● Cold elevator bins.

(Continued on page 130)

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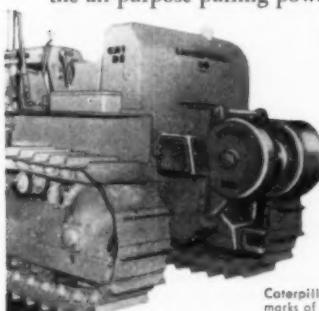
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ROADS AND STREETS, November, 1956



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HYSTER COMPANY

A full line of Winches
for Caterpillar-Built
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Bituminous Concrete

(Continued from page 128)

efficiently, an inspector can control his mix at this end of the plant.

If you have set up a design whereby you do not have the material there to start with, then of course you will get into trouble. For example, suppose we were using a 1-in. size aggregate, and our $\frac{1}{2}$ -in. screen is our control screen. Suppose we set it up for 62% one half inch material and we have only 55% in the raw aggregate. We could not very well get 62% out. So, many agencies do propose to have a specification whereby it must meet the grading requirements at the cold elevator.

I cannot impress upon you too strongly the necessity of controlled stockpiles, well graded material, well particle shaped materials.

● *Start of Processing Material Through the Plant.* Many plants are operated with a three-compartment bin for proportioning the cold feed.

Today, if I were setting up a plant, I would want at least four cold bins, for this reason: Design engineers today are thinking about breaking down the aggregates into more sizes so that in the plant they can fill up the voids and know what size aggregates are in there.

For example, if you are shy on $\frac{1}{2}$ -in. material in the mix, you can blend. This blending in stockpiles you know about, but I have yet to see a satisfactory way of blending material in a stockpile. You can pick a sample that will pass, and for every one you pick that will pass, you will find one that will not pass. You get the same thing when it goes through the plant.

Automatic Feeds

Many agencies are requiring automatic feeds today to insure an uniform feed through the drier. This is a spot where, if the aggregates are running uniform in gradation, you do not have to bother the proportioning gates too much. When I say "uniform", there could be 7% plus or minus the design screen on which you set it, or the design percentage on which you set your mix. If it runs outside that, there has to be an adjustment of the cold feed. I know somebody is thinking, "What's the difference? We are going to screen and separate it a little later on, anyhow." I will show you later why I think it should be taken care of here.

In order to be assured of a continuous feed, it is well to keep your bins full at all times. This is so that you keep the weight on the material, forcing it down onto this automatic feed. In many cases today the engineers are requiring vibrators on the

bins to assure a continuous flow of material.

● *Dust Collecting System.* The dust collecting system is a very important part of the plant operation. A producer at one plant told me that his dust collecting system has paid for itself, in that he does not have nearly as much machinery maintenance in his plant because he keeps it clean. You can walk into this plant with your business suit, and you will have hardly any dust on it when you leave.

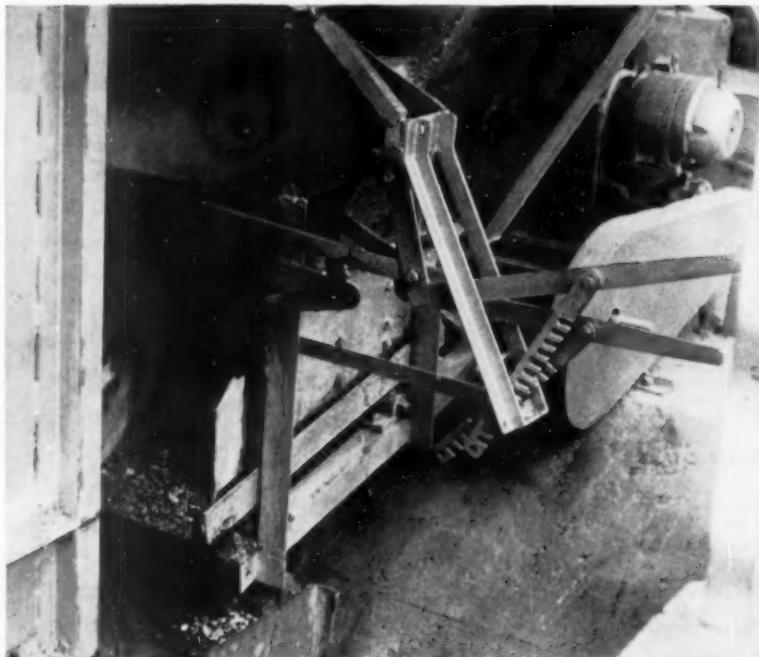
He collects dust at the back of the plant where the aggregate drops into the drier. The fan is a center draft fan which pulls the heat through the drier, also pulling out the dust.

As we go on through the plant the same is true where the aggregate drops onto the screens, over the screens, and over the pug-mill. This system has worked excellently. Later on I will point out the importance of the dust collected, and what can be done with it.

The man on the aggregate pile is an important person in the plant. The next man of importance in the plant is the one running the drier. Many people think that the driers will take 60 or 70 tons an hour, or whatever the figure might happen to be. The drier will take only as much material as it can heat and dry.

● *Aggregate Temperature Governs.* Usually a 60 ton an hour drier is set up on the basis of 3 or 4% moisture in the aggregate. Again it depends on the aggregate. Some aggregates are porous and will take up moisture; others will dry very quickly. The thing I want to point out here mostly is that the aggregate itself controls the temperature of the mix, not the asphalt. The asphalt is put on in such a thin layer on each particle of aggregate that the second it comes in contact with the aggregates it assumes the temperature of that aggregate.

If you are heating aggregate for hot asphaltic concrete between 250 and 300 degrees, you will find that as long as your aggregate is dry the drier will dry 60 tons an hour if set up to do that. However, if the aggregate is wet, you have to cut down your feed in order to dry the aggregate and also heat it. Increasing the heat to drive off moisture often results in driving the moisture into the aggregate. Many times the moisture that is being driven into the aggregate by overheating will not show up until you receive the material on the job, then it comes out of the aggregate



● Gate adjustment levers for cold feed.

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See you at the Road Show, Chicago, Jan. 28 - Feb. 2; Booths 23-24, Materials & Supplies Section

. . . for more details circle 180, page 16

ROADS AND STREETS, November, 1956

Bituminous Concrete

(Continued from page 130)

and will strip the asphalt from the aggregate.

I say that the temperature of the aggregate should be within 15 degrees plus or minus the temperature of the asphalt; and that the temperature of the asphalt should be based on the viscosity between 75 and 150 seconds of the asphalt that you are using with 150 seconds being the ideal.

• *Viscosity vs. Laying Temperature.* That is rather technical, but it is not so hard. In other words, from your producer of asphalt you can secure a viscosity chart on his asphalt, which will show you the best temperature to apply his asphalt at a viscosity of 150 seconds. Let us take a hypothetical case. At 150 seconds the best temperature for 85 to 100 penetration asphalt is probably 285 degrees. Then you vary the temperature of the aggregates, and keep the asphalt at 285 degrees, and you can stay within a 250 or 300 degree range pretty well, which is a good laying temperature for hot asphaltic concrete in most sections of the country under good weather conditions.

However, once you start overheating the aggregate, up to, say, 400°, what you are doing is cutting back the penetration of the asphalt. The minute it hits the aggregate it will not be burned, but will cut back the penetration. It also will thin out the coverage over the surface area which you have.

So, this man is highly important, because after a day or night of rain this man has a job. The contractor should not expect to get 1,000 tons a day if he has had two or three days of rain, because the morning production is going to be cut down (if they are running the plant properly); he cannot get this tonnage through the drier. If you do not get the moisture out, then you are going to have stripping of asphalt.

Consider the heating chamber. A lot of specifications throughout the

Only through education can come better and longer lasting pavements. However, I have noticed that only the top echelon are given this education program. Would it not be well to consider the field personnel who actually do the work and also educate them?

This can be accomplished by holding schools at the various air com-

country are still written today stating that the flame is not supposed to touch the material. It goes into the drier perhaps 2 feet. I see nothing that hurts the aggregate at all as far as the flame touching it at that time is concerned.

There are flights that pick up the material and bring it through the drier. The drier is set on a pitch, and the flights pick it up and take it through.

Actually, you have no so-called flame coming in contact with the material. The aggregate is actually heated and dried by hot gases rather than by the flame itself. As the material is picked up at the top, it is dropped down and those hot gases go through it. You can understand what a tremendous amount of heat you can pull through there and heat your material.

• *Pyrometers Essential.* All plants shall have pyrometers to determine the temperature of the material going through the drier. The pyrometer in this case is located at the intake end of the drier, right at the cold elevator. It has a wire that leads down to the outlet end of the drier, or down near the hot elevator. Here the man can observe the temperature of his material and adjust the feed into the drier as is necessary to maintain temperature and moisture control.

Unless he watches this very closely, the man out on the job will be in trouble. I have seen it happen that in the morning, after a rainy session, the first load will come out at 300 degrees. The next couple of loads taken out will be down to 250 degrees because the plant man has changed his feed. The 250 degree material probably should be rolled right away. We cannot roll the 300 degree material as yet because it picks up on the rollers. The roller man is not going to run around the 300 degree material and roll the 250, and then come back and roll the 300. So, by the time we get to the 250 degree material we do not get the compaction on it that we should because of loss of heat in the material.

The only thing you have in there

mands. No one officer can cover the entire asphaltic concrete operation. Unless the personnel under him know their duties, he can be the best educated officer and still end up with a poor project.

Also, I believe the contractor should be well-informed as to the requirements, and he too should be schooled.

for workability is heat. Unless the mix is rolled at the proper time, you will not arrive at the proper compaction.

The material is next deposited from the drier into a bucket type hot elevator and carried to the screens. Here, also, is a chute which runs into the hot elevator where the dust collected may be returned if permitted by the engineer. This device is mechanical.

Can the dust be added back into the material? If the dust collected is uniform in grading, then I think it should be added back, provided there is not too much of it. I have seen plants that actually collected as much as four or five truckloads of dust a day. That would be too much to add back, and some of it would have to be wasted.

Uniformity of gradation means that if you have a large amount of 200 mesh material, or any other size material that you are collecting, then it should not be added back, because the pavement will become too stable and will crack.

Once again we have Old Man Voids. What you are trying to do with these small particles is to fill the voids. If you have material that is uniform, that will help to fill the voids, then it can be added back; otherwise I would say no.

• *Plant Screens.* What I call the third important bottleneck in the plant—are the screens, in a typical case a 4-deck screen. The plant can produce only as much as it can screen efficiently. By feeding the drier too fast and overloading these screens, you are going to get into trouble, because you design your mix on the material from your bins. Suppose in Bin No. 2 we found 10% of the material passing the No. 6 screen or fine aggregate that should have been in Bin No. 1.

We make adjustments in our design to weigh out 10% of the No. 6 material in Bin No. 2, so as not to overload the mix with fines. The mix ran along for awhile and looked good, suddenly we find the mix too fine, so we check our bins. Instead of 10% No. 6 material in Bin No. 2, we find 25% No. 6, and in Bin No. 3 another 10% of No. 6 material where before there was no No. 6 material. This was caused by overloading the screens and has changed our design completely.

After the design has been set up, the screen efficiency must remain uniform. That is generally controlled by the feed at the cold elevator. Also, the screens should be checked for holes and clogging.

Again I talk about uniformity, and

what these screens can do for you. If you are running material over the screens and are getting 30% screen efficiency, and if it is uniform, it is all right, because you can account for it in your design. However, if you are running over the screens and getting 10% screen efficiency one time, and 50 or 60% screen efficiency the next time, then you are not going to end up with an asphaltic concrete design that is uniform.

In many places the engineers specify screen efficiency, and it is not exactly the way the screen people or cloth people talk about screen efficiency. In Pennsylvania, for example, the highway department has a 15% plus or minus screen efficiency, and they break on the number of each screen. They do not care what size screens you put in your plant, the engineers base it on specified laboratory screens—No. 8, which means that in Bin No. 1, where the No. 8 material is supposed to go, you might put a $\frac{1}{2}$ -in. screen on it, but you may not have more than 15% retained on the No. 8 screen in that bin. In Bin No. 2 you may not have more than 15% passing the No. 8 screen, or more than 15% retained on the $\frac{1}{2}$ -in. screen. On this bin you might use, depending on the particle shape of the aggregate, a 9/16-in. or $\frac{3}{8}$ -in. screen. On Bin No. 3 they would not permit you to have more than 15% passing the $\frac{3}{8}$ -in., nor of course any material retained on the 1 $\frac{1}{2}$ -in., which is the top screen. That is what we mean by screen efficiency.

What does it do to you? After you have set up your design, you are basing anything that you have in that plant on the idea that you are going to weigh it out from each of these bins. In other words, if we could take the aggregate and split it up upon a passing-retaining basis for each screen, we would like to use materials (going back again to our voids) which would fill our voids; then we can weigh out each individual size of the material we want.

A gentleman said to me yesterday, "I don't see why they don't tighten the specifications."

That is what some of the highway departments are coming to. I agree that they are going to have to pay for it, but we are arriving at something that is going to give us a better pavement. It can be done in a 3 and 4 bin plant, providing we first have the material in the stockpiles to do it with; secondly, providing we do not have a lot of segregation; thirdly that we have a well particle shaped material; and, fourthly, that we have controlled screen efficiency.

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and any other surfacing material is dependent upon the aggregate that you use, the interlocking of those aggregates. Again, I repeat, the only thing we do is to hold it together with asphalt.

Then there is the filler bin which brings the 200 mesh material up to the weight hopper when needed.

• **Hot Bins.** Consider the 4-bin plant. There is an oversize chute for oversize materials that might get into the aggregate; these are then scalped out by a scalping screen.

The fine aggregate goes in Bin No. 1. Consider that material that will pass a No. 6, 8, or 10 sieve depending on the specification you are working with; in Bin No. 2, that material that would be retained on a No. 6, 8, or 10 and pass a $\frac{1}{4}$ -in. or $\frac{3}{8}$ -in. depending on the specification you are working with; in Bin No. 3, that material that would be retained on the $\frac{1}{4}$ -in. or $\frac{3}{8}$ -in. and pass a $\frac{1}{2}$ -in. depending on the design; and in Bin No. 4, that material that would be retained on the $\frac{1}{2}$ -in. and pass the top size screen, say $1\frac{1}{2}$ -in. in this case.

I cannot impress upon you enough the importance of the uniformity of the feed-back at the cold elevator and the grading of the aggregates as to the control of these bins. If the grading of the aggregate, say on the $\frac{1}{2}$ -in. material, were to change from 45% to 25%, then Bin No. 3 would become empty in time and Bin No. 4 would be overloaded. The material should never go above the overflow openings, and the contents in each bin should remain uniform.

Secondly, the man who is weighing out the material seems to think he is doing his boss a favor. He pulls the required amount of material from the first, he pulls the required amount of material from the second bin, and in Bin No. 3 what does he find? He is supposed to take 500 lb. from this bin, and he only has 200 lb. in it.

"Well, I can't hold up production, so I'll go over and take it from Bin No. 4." So he does that. Is he doing the producer a favor? I don't think he is. His employer's best advertisement is a good product—a good job. If not, then he is to blame. Here is where a lot of it happens.

• **Hot Bin Gradings.** Remember that from these bins comes the material on which you run gradings, or on which the designing engineer runs gradings to set up his design. He cannot change those designs every fifteen minutes.

Let me repeat again that the basis of a good asphaltic concrete design is controlled in these bins and is dependent on the uniformity of the aggregate as it goes into the mix, and on the screening ability of the plant to screen uniformly and within certain ranges. When I say "within certain ranges," I do not say you have to set a 15% screen efficiency.

Screen Efficiency

Again, if you have a 30 percent screen efficiency, and if it stays there all the time, you are just as well off, because you can compensate for it here. If you are getting 30% of Bin No. 1 material over in Bins No. 2 and No. 3, then you can compensate for it in the design, but you cannot do anything about it if you get 30% one place one time and the next time, because they are not feeding as fast, and let us say 20% of that goes into Bin No. 1, and you have only 5% in these other two bins, then your design is off and you are in trouble.

The plant I am speaking about has a heating device placed on the bins. I think it is a good idea, whenever you are mixing hot asphaltic concrete, particularly, to know whether or not (or how long) you can leave the material in your bins. The reason for this is again the only workability that

you have out on the project as far as compaction is concerned, is the heat in the material.

The designing engineer takes his samples at the bins and designs on the basis of the material in those particular bins. Leading from the cold elevator up to this point, I hope I have shown you what can happen to you as far as these samples are concerned. I would insist at all times on any inspection force taking large samples of material from these bins, also that the plant has run a sufficient amount of material into the bins to simulate just what your production is going to be when you actually go to do the job.

This design is set up prior to the time the job starts. If you get only a little bit in the bins, it is not indicative of what you will actually get when you are in full production.

Many plant manufacturers today realize the importance of getting adequate samples, and are doing something about it. Some of our older plants which we still have around do not have a very good means of selecting samples. There are a lot of so-called Rube Goldberg ideas around the country, whereby people have set up different devices for sampling.

For example, running a track under the bins so they can set a container under it that will fit the entire outlet openings of the bins. Take large samples; approximately 50 lb. of the fine aggregate and quarter; 100 lb. of coarse aggregate and quarter.

• **Weight Hopper Over Mixer.** The weight hopper is directly over the pug-mill. The material is weighed and deposited into the pug-mill.

I said before, and I will repeat once more: Take the lever man who thinks he is doing you a favor. He gets the right amount out of Bin No. 1. He gets the right amount out of Bin No. 2. He does not get the right amount out of Bin No. 3, so he goes to Bin No. 4 and takes it all out of there. He is not doing you a favor, and he is not doing asphalt any favor either.

The pointers should be set up on the scales. After all, the man up there is important. After you have gone to all the trouble to give him well graded aggregates, and you have gone to the trouble of taking it through the plant correctly, if he does not weigh it out correctly you still end up with a poorly designed material.

• **Asphalt Meter and Bucket.** Some plants proportion asphalt through a meter. These meters are very delicate, and there should be a take-off some place between the meter and the pug-mill, so that the meter may be checked.

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In the case of asphalt buckets, I would like to say they should be checked at least once a day with weights, but they should be checked more than that the first thing in the morning; the first two hours of operation, let us say, they should be counter-balanced after every truckload of material.

The reason I say that is this: You get an accumulation on the sides of the buckets which cools off overnight. In the morning, when you start to weigh out material the heat of the new asphalt will loosen some of that which has accumulated on the sides and bottom of the bucket. This will change the tare weight of the bucket.

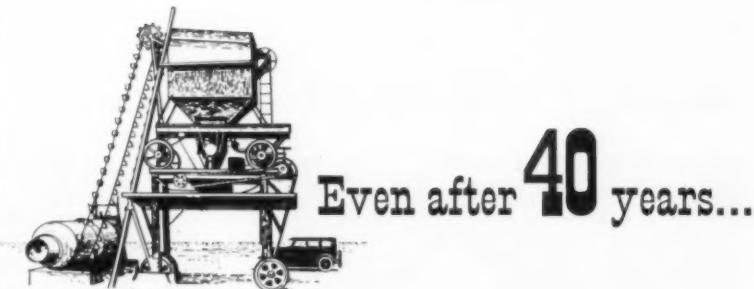
Most designing engineers today are trying to get enough asphalt in there so they have reached the peak. In other words, they have put just as much asphalt in there as it will possibly take. Any additional asphalt in there is going to cause flushing, with the result that there might be just enough asphalt on the side of the bucket to cause some flush spots. It takes only a second to kick the balance beam back and to balance the bucket. I have found as much as 7 or 8 lb. difference from 6 a.m. to 8 a.m.

All plants should be equipped with an asphalt armored thermometer of suitable range and placed in the asphalt line near the discharge end of the line. The temperature of the asphalt should fall within a viscosity range of from 75 to 150 sec., with 150 sec., the most ideal temperature. In no case should the aggregate be more or less than 15 or 20 deg. from the temperature of the asphalt.

Many specifications today require plants to have timers. The time of the mix is produced mechanically. In other words, it is controlled mechanically. Many specifications call for dry mixing periods of 15 seconds, which are controlled by the timer and 40 seconds mixing time also controlled by the timer.

• *The Mixer.* The pug-mill, I think, is another important feature. In many cases you will find that a paddle is broken. One paddle broken will not hurt too much, but if you have two together broken, it will hurt a lot. It is difficult to shut the plant down and try to fix a paddle when you have been running for 3 or 4 hours, because of the heat in there. It takes awhile for the pug-mill to cool off. I do not think one broken paddle will hurt anything; but when you get a paddle broken off and another broken off right next to it, then it should be

(Continued on page 151)



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International TD-6 Crawler Tractor with Bucyrus-Erie Hydraulic Angle-blade. New rails. \$2,500.00

Allis-Chalmers Model HD-15 Tractor equipped with Gar Wood Cable Bulldozer and Model 281 Double Drum Power Control Unit. Completely rebuilt. 90-day warranty. \$9,000.00

Gradall Model 2460 mounted on International KB-8-F Truck. \$4,800.00
(20% of new price)

Allis-Chalmers Model HD-5G Crawler Tractor Shovel. Rebuilt. 90-day warranty. \$7,000.00

All equipment will be demonstrated at our Lancaster yard.

FRANTZ EQUIPMENT COMPANY OF LANCASTER

P. O. Box 1106, Route 72 (Manheim Pike)

Lancaster, Pa.

Phone: LANCASTER 5-0546

PILE DRIVING EQUIPMENT

VULCAN AND MCKIERNAN-TERRY Steam Pile Hammers and Extractors

- DROP HAMMERS
- STEEL LEADS
- DRIVING CAPS
- PILE DRIVER HOSE
- HOISTS AND BOILERS

STEEL SHEET PILING

Pcs.	Section	Length	Location
110	MP-115	60 ft.	Kansas City
100	MP-116	60 ft.	Kansas City
244	MP-116	35 ft.	Wisconsin
260	MP-112	14 to 17 ft.	Iowa
160	MP-116	28 to 30 ft.	Colorado
130	MP-112	19 to 25 ft.	Montana
50	MP-116	24 to 27 ft.	Kentucky

PHONE
DRexel 1-3930

CONMACO
CONTRACTORS MACHINERY COMPANY
806 KANSAS AVE., KANSAS CITY, KANSAS

FOR SALE

BARBER-GREENE UNDERTRACK CONVEYOR

FAIRFIELD UNDERTRACK CONVEYOR

2 INTERNATIONAL ID 6 TRACTORS

MODEL M FARMALL TRACTOR

MODEL H FARMALL TRACTOR

BUFFALO-SPRINGFIELD 3 WHEEL 10 TON ROLLER

SEAMAN PULVIMIXER

WOODS MODEL 54 ROADMIXER

CLEAVER-BROOKS TANK CAR HEATER

Above equipment located in
South Carolina

BALLINGER PAVING CO.

P.O. Box 927
GREENVILLE, SOUTH CAROLINA

DRAGSCRAPER

Sauerman Long Range Dragscraper; two drum, heavy duty hoist unit. 3 Cu. Yd. Crescent Scraper bucket with teeth. IHC UD 1091 Power Unit. All necessary cables and clamps for 500' span. Just like new. Used less than 50 hours. Can be seen in our Sioux Falls yard.

SIOUX ROAD, INC.
Sioux Falls, S. Dak.

WANTED

802 Lima Lifting crane. Late model with double boom hoist. Gas or diesel.

FRANK FAMALETTE EQUIPMENT CO.

P. O. Box 325
Hazleton, Pa. GL 5-4708

CLEARING HOUSE SECTION

LOOK!

1201 LIMA DRAGLINE, 80' Boom, Cummins Diesel Koehler 1500 watt Light plant, 18' crawlers, 44" treads, 3 yd. Page Drag Bucket. Machine new 3/30/- \$1. Immediate delivery. Price on cars—\$70,000.00. Condition excellent!

4—TS300 ALLIS-CHALMERS SCRAPERS—Excellent condition, excellent rubber. Three machines 1½ years old, one machine 2 years old. Sacrifice at \$17,500.00 each.

6—91FD EUCLID REAR DUMPS—rebuilt or being rebuilt, excellent rubber. Real clean—\$8,500.00 each.

1005 KOEHRING DRAGLINE, Cat. Diesel—80' Boom. New 10/5/52. Light plant, etc. A good one! Loaded on cars—\$70,000.00.

65 BAY CITY SHOVEL—Cummins Diesel. New 1954. Loaded on cars \$17,850.00.

Llewellyn Machinery Corp.

CALL — TEX ARNOLD
In Miami, Florida Highland 4-2541

or
Vern Ley in Tampa, Florida
Phone 71-0101

600 Jaeger Air Compressor S/N C14180 powered by UD 24 International Diesel Motor good condition, 1953 model. Priced \$5750.00 F.O.B. Fort Worth, Subject to prior sale.

AMERICAN MACHINERY & EQUIPMENT CO.

921 No. Henderson
FORT WORTH, TEXAS
ED-29721

TIRES

8 825x20 10 ply Frst. tires — 1sts. \$58.00, tax incl.
9 1100x22 12 ply U.S. Fleetway, 1sts. \$120.00, tax incl.
14 1000x15 12-14 ply used tires. No repairs.
2 825x15 12 ply used tires. No repairs.
18 1200x24 8 ply used tires.
6 1300x24 8 ply used tires. Traction tread.
12 1300x24 8 ply used tires, smooth type tread for black top.
6 1300x24 8 ply recap tires.
2 1300x24 10 ply recap tires.
10 750x20 10 ply recaps — no repairs.
40 825x20 used tires.
6 36x6 10 ply used tires.
6 38x7 10 ply used tires.
10 1000x24 12 ply used tires.
3 1600x20 18 ply used tires.
30 600x16 6 ply Town and Country Recaps.
KM-24 new #2 Frst. tubes—\$9.00.
1200x24 New #2 Gdry. tubes—\$9.50.
1400x20 New #2 Gdrich. tubes.—\$10.50.

NORTHWEST RECAPPING, INC.
41 W. Fillmore St. Paul, Minn.
CApital 4-7349

FOR SALE

Michigan Truck Crane, Model TLDT-20 Serial No. 530. Complete with tailgate, fairleads, 70' boom, 15' jib, worm gear hoist, 1,000# counterweight and all standard equipment. Crane is 2 years old and is in excellent condition.

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SAVE

\$ \$ \$ \$

TWO

Euclid S-7 Rubber Tired Scraper Units

Less than 1,000 hours. Almost new condition. Priced to liquidate — only \$17,000 each

CHOATE EQUIPMENT CO.

Cedar Rapids, Iowa
Phone 4-0225

FOR SALE

Huber Model 801 Motor Grader
UD-16 Diesel Engine, good tires—
reconditioned \$8,500

Wilson Machinery & Supply Co.
Telephone No. 3-1455
Lexington, Kentucky

BARBER-GREENE ASPHALT PLANT For Sale

1—848-SN 1654 Mixer (Volume 3" below top 55.1) A5-848-232W (Mfg. 7-16-54)

1—811 A Fines Feeder

1—880-18-3" Hot Elevator with dolly

1—866 Graduation Unit

1—880-27-6" Hot Elevator with dolly

1—837-954 Low Pressure Dryer

1—847 Dust Collector

1—24" x 39" Conveyor

1—813 Feeder with steel housing

1—Asphalt Meter

The above is priced at \$75,000.

If the following is included,
the price is \$85,000.

1—10,000 gal. Asphalt Tank

1—4,000 gal. Fuel Oil Storage Tank

1—Set Asphalt Piping

1—C100 Childers Hot Oil Heater (new 7-1-55)

The above plant has had 49,000 tons put through it since it was new and is in excellent condition.

INLAND ASPHALT CO.
P. O. Box 4116, Station B.
10th & Havana
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WANTED

D-4 Hydraulic blade complete for wide gauge
D-4 Tractor.

Cat Cable blade for D-7—3T Ser. front cable unit.

FOR SALE

2 D8 Dozers—BR Ser.

1 D7 Dozer—3T Ser.

1 D4 Hydraulic Dozer.

1 D4 Cable angle dozer.

1 D4 Straight cable dozer with Hyster winch.

1 D6 Hydraulic angle dozer.

1 D6 Cable dozer & DD cable winch.

212 motor grader diesel tandem.

2 Galion diesel tandem graders.

1 Northwest Model 25 Crane drag comb cat, diesel motor.

8 Crane Booms new unused 30' long 2 sect. butt end will fit most ½ yd. & ¾ yd. cranes.

1 Crane boom 45° for Bay City Model 65.

6 Dragline buckets 2½ yd. & 3 yd. capacity.

1 ½ shovel bucket unused. Will fit Lima Model 34.

1 300 Amp Hobart Welder, gas powered, like new. Skid mounted.

All above items subject to prior sale.

TESTA BROS. INC.

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#34 LIMA 25-TON CRANE
\$14,500. 35' Boom. Fairleads for Dragline work. On 6 wheel drive carrier, good condition. Will be available for delivery 1st of October. Additional boom available @ \$20.00 per foot. This crane is in our private service.

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Phone Walbrook 5-7733

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SHOVELS - DRAGLINES DRILLS CRANES - EUCLIDS

9-W Bucyrus-Erie Drag, 165', 10 yd.
625 Page Diesel Drag, 150', 10 yd.
625 Page Diesel Drag, 160', 9 yd.
6160 Bucyrus Monighan Elec. Drag, 160' 8 yd.
621 Page Diesel Drag, 135', 5 yd.
621 Page Diesel Drag, 125', 7 yd.
7200 Marion Drag, 120', 7 yd.
200-W Bucyrus Monighan Drag, 140', 6 yd.
2400 Lima Drag, 120', 6 yd.
4500 Manitowoc Drag, 120', 5 yd.
620 Page Diesel Drag, 115', 6 yd.
120-B Bucyrus-Erie Elec. Drag, 115', 5 yd.
111-M Marion Drag, 80', 5 yd.
1055 PGH Drag, 110', 4 yd.
1201 Lima Drag, 85', 3 yd.
3500 Manitowoc Drag, 80', 2 1/2 yd.
1001 Lima Drag, 80', 2 1/2 yd.
955 PGH Drag, 100', 2 1/2 yd.
54-B Bucyrus-Erie Drag, 85', 2 1/2 yd.
80-D Northwest Drag, 65', 2 1/2 yd.
170-B Bucyrus-Erie Elec. 6 1/2 yd. Shovel
1600 PGH Elec. 6 yd. Shovel
1500 PGH Elec. 5 yd. Shovel
120-B Bucyrus-Erie Elec. 4 1/2 yd. Shovel
111-M Marion 4 yd. Elec. Shovel
111-M Marion 4 yd. Diesel Shovel
1055 PGH 3 1/2 yd. Shovel
1201 Lima 3 1/2 yd. Standard Shovel
111-M Marion 3 yd. High Lift Shovel
1201 Lima 2 1/2 yd. High Lift Shovel
3500 Manitowoc 3 yd. High Lift Shovel
80-D Northwest 2 1/2 yd. Shovel
54-B Bucyrus-Erie 2 1/2 yd. Shovel
38-B Bucyrus-Erie 1 1/2 yd. Shovel
25 Northwest 3 1/2 yd. Shovel
22-B Bucyrus-Erie 3 1/2 yd. Shovel
Unit 1020 3 1/2 yd. Shovel
802 Lima Cranes
600 Reich Heavy Truck Mounted Rotary Air Drills (Both Lever Arm and High Mast)
58-BH Joy Champion Rotary Air Drills
Also 42-T, 29-T and 27-T Well Drills

FRANK SWABB EQUIPMENT CO., INC.

313 Hazleton Nat'l. Bank Bldg.
Hazleton, Pa. Gladstone 5-3658

SHOVELS CRANES DRAGLINES

Bay City Model 25 1/2 yd. Shovel dragline & Crane attachments \$7000. Loraine L-20 Comb. Crane Shovel & Dragline Ser. #15634 \$6,200. Marion Model 331 3/4 yd. Shovel Ser. #7659 \$7,500. Marion Model 48 Hi-Lift Serial #8514 \$27,500. Loraine 82 Ser. #1460 \$24,000. Manitowoc Model 3500 Hi-Lift \$33,000. N.W. 80D Serial #8666 \$25,500.

Attachments

Shovel Front for Bucyrus-Erie 51B \$3,750. 45 ft. Crane Boom for Bay City Model 65 \$715. Fairleads for Bucyrus-Erie 54B, \$1,200. Shovel Front for 22B Bucyrus-Erie, \$1,875. Loraine 820 Boom, Long Shovel Attach. & Strip \$3,850. Standard Shovel Attach. for Loraine 820 \$3,850. We also have for sale scrapers, graders, Euclid, Cats, & LeTourneau Rubber Tired Equip. Cat. A.C. & Int. Tractors Compressors, Stiff leg Derricks, Batch Trucks, Conveyors & many good used bargains. Send us your inquiries.

MASON & BACON

McClure Bldg., Frankfort, Ky., Ph. 3-8289

FOR SALE - RENT

Crawlers — Scrapers — Tractors

- I 1956 Cat D8 Hyd 8/8 Dozer, oil clutch crankcase guard and pulibook, ser. #11A1672, series "E", 950 hours \$25,000
Equipment for above Cat, \$2,000
- I 1956 Cat 463 Scraper, 2 front 21x25 20-ply, rear 24x29, 21-ply; 450 hours \$12,550
- Cranes — Shovels — Backhoes**
- I 1956 Little Giant, comb, crane, dragline, clamshell and backhoe, 3/4 yd. cap, mounted on Zellison Mod. #106, w/o carrier, 8,250lb tires \$13,563
- I Byers 8J Comb. Crane, Clam, Dragline, 35' boom, 30" shoes, 12' 8" long, crawlers, powered by Herkules cyl. 400 engine, bucket with hoist, 3/4 yd. steel. LeTourneau bucket. New 1952, Ser. #Z105 \$7,800.00
- I Byers 1942 Shovel, 360 degree swing, 3/4 yd. crawlers, driving sprockets, engine and bucket in perfect cond. Work has to be done on boom and dipper sticks. Machinery deck or upperworks is fair \$2,600
- Attachments — Buckets — Etc.**
- I 1940 Lorain Shovel Fronts, used very little (1 and 2 months service), 1 crawler and 1 hydraulic crawler, each \$1,250
- I 1/2 yd. Clam Bucket, Pettibone-Milliken, rigged with ext. and teeth, never been used, will sacrifice \$875
- I Fairlead for 3/4 yd. to 1 yd. machine, Link-Belt type very good \$250
- Graders — Rollers — Unloaders**
- I Cat 212 Motor Grader, 1R118SP tandem drive, 360 hours, very good running condition \$2,500
- I 2-Ton Littleford, Ser. #26716 \$1,000
- I Barber-Grainger Car Unloader, steel wheels, Wisconsin engine Md. AHH, new belt, Ser. #68842, very good \$250

Concrete Equipment — Truck Mixers

Miscellaneous

- I Four Compartment Bin, 100 cu. yd. cap, 3 aggr. I cement bucket elevator for agrgr. bucket elev. for cement, serv. conveyor, 3 pd. batcher, 3 aggr. and I cement with 4-5,000# weigh breaker, 10' diameter under batcher, 400 lb. cement silo air compressor, w/ motor, steam boiler for heating agrgr. and water batcher (volume metric). Less than a year old. Original price \$25,894. WILL SACRIFICE \$16,500
- I 1955 Mod. #620 GMC Tandem equipped with the following: 3 speed Brownie, 5 speed main transmission, 426 cubic inch engine with Eaton-Henderson 2000 Bogie rear right side, 2 19-20 conventional tires from 8-10.20 combination and off the highway tires, spoke wheels; 5/4 yd. Jaeger mixer new 1955, 7 yd. agitator. These units are exceptionally clean and are priced to sell, less than one year old, each \$11,500
- I 1952 Ford, F-8, Cook Brothers chain drive, 3 speed Fuller, 3A65 amperes, transmission, brand new rubber, 2-90-90-90 conventional tires front and rear, 9.00x20 comb. on and off highway tires, rear; straight air brakes, 11,000 lb. front axle; mounted 5 yd. Challenger mixer new 1952, 6% agitator, powered by 6 cyl. Ford engine. This unit has been rebuilt and is clean and painted \$5,600
- I 1954 Bissell-Knox Mixers, 3 yd. with Hercules 4 cyl. engine. Very clean, good operation cond., unmounted, each \$750. Also have new and used concrete vibrators, trowelers, saws, concrete buggies, etc.

For Rent or Lease

- I Link-Belt LS70 with Cat D315 engine as comb. hoe, shovel, crane, clam or dragline.
 - I Insey K-12 with Chrysler Ind. 12 engine; shovel and hoe front only.
 - I Gardner-Denver 210 Air Compressor with Buda gear pump, 100 cu. yd. capacity.
 - I International TD6 with 3/4 yd. dryd. hi-lift.
 - I Little Giant 3/4 yd. backhoe, crane and clam mounted on Zellison T-66 6x6 carrier, both upper and carrier new.
 - I Parsons 221 Ditcher: Buda gas engine.
 - I Fordson w/front loader: Sherman backhoe.
 - I Oliver Model 88 Backhoe.
- We Also Buy Equipment ... Send Us Your List

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ARMY SURPLUS WINCHES

\$75.00 to \$125.00
with and without 250 cable

Excellent Condition

CHAZEN'S SURPLUS

1721 N. Federal Ph. 450
MASON CITY, IOWA

FOR SALE

HEAVY CONSTRUCTION EQUIPMENT Located Downsville, N.Y. All offered subject to prior sale

- I 10-EUCLID Bottom-Dump Model 43 FDT, 13 c.y.
 - I 1-EUCLID Loader, Model 3 BV, Serial BV 22.
 - I 8-STERLING Model HCS 297 End-Dump Trucks, 12 c.y.
 - I 8-CATERPILLAR Tractor-Dozers, 1 H Series.
 - I 2-ROCK RAKES with LE TOURNEAU Bulldozer Connections.
 - I 3-CATERPILLAR Model 12 Graders.
 - I 1-LIMA Type 120 3 1/2 c.y. Shovel/Dragline Combination.
 - I 1-BUCYRUS-ERIE 2 1/2 c.y. Shovel/Dragline Combination.
 - I 1-LORAIN T20 1/2 c.v. Moto-Crane, Shovel/Crane, Backhoe Combination.
 - I Shovel Front Complete for Bucyrus-Erie 54-B.
 - I Digging Bucket for PGH 1055, 3 1/2 c.y.
 - I Dipper Handle for PGH 1055.
 - I Page Dragline Bucket, 1 1/2 c.y., Type AX.
 - I Owens Clamshell Bucket, 3/4 c.y., Type D.
 - I Heitzell Concrete Bucket, 1 1/2 c.y.
 - I Blaw-Knox Concrete Bucket, 1 c.y., Model C-31 KB.
 - I Wiley Concrete Bucket, 1 3/4 c.y.
 - I REX Model 160 Double Pumpcrete, complete with 7" pipe fittings and assortments.
 - I 1-GARDNER-DENVER Grout Pump, Model EF-F3, 10x1x10.
 - I 1-MALSURY Steam Cleaner, Model 322-OMS17, mounted on GMC 6x6 Truck.
 - I 4-WORTHINGTON 2-Stage Turbine Pumps, Model 12-QG-H2 (2 electric and 2 diesel driven); capacity 1500 GPM @ 110 ft. head, @ 1770 R.P.M.
- GROUP OF 12 ASSORTED PUMPS (Marlow, Carter Gorman-Rupp, C.H.G.E., Worthington, 3" to 6", Centrifugal).
- I 1-FORD Truck, 16 ft. Platform, Model FB, Serial 8E9-7341.
 - I 1-INTERNATIONAL Truck, Model LF172, Serial 661, mounted with 1500 gallon oil tank.
 - I 1-INTERNATIONAL Truck, Model L162, Rack Body, Serial 3530, mounted with Lubrication Equipment, Worthington compressor and Wisconsin engine.
 - I 1-BRUNNER Electric Compressor, Model HOB7C.
 - I 1-INGERSOLL-RAND Compressor, Model V-253-N5, 5x3x3 1/2.
 - I 1-INGERSOLL-RAND Compressor, Portable 315 c.f.m. Cummins diesel engine H86.
 - I 1-WESTINGHOUSE Electric Compressor, Model 3 VC.
 - I 1-HOBART Electric Welder, 300 amp. 220/440 V.
 - I 1-WESTINGHOUSE Electric Welder, 300 amp. Model DC-Type RA-220/440/550 V.
 - I 1-PGH Electric Welder, Type WG-301, 60/375 amp. Generator; Chrysler Model IND engine, type GA-211.

LARGE ASSORTMENT AIR TOOLS (Jackhammers, Paving Breakers, Tamers, Rivet Hammers, Rivet Busters, Impact Wrenches, etc.)

MISCELLANEOUS SMALL EQUIPMENT AND POWER TOOLS (Power Saws, Drills, Sanders, Grinders, Bar Bender, Light Plants, Hydraulic Jacks.)

REPAIR PARTS—Large stocks—for Allis-Chalmers Tractor and Grader, Baker Bulldozer, Bendix-Westinghouse, Buda, Cummins and G.M.C. diesel engine, Caterpillar Tractor, Delco-Remy, Euclid, International Tractor, TD24, International, Dodge and Ford Truck, Gas Wood Hydraulic Hoist, Jaeger Mixer, LeTourneau, Lima Shovel, P&H Shovel, Rex Pumpcrete, Sterling Truck, and others. Also large stock miscellaneous hardware items (bolts, nuts, etc.) Complete lists furnished on request. Will price right for bulk sales.

"GRIZZLY" EARTH PROCESSING PLANTS Plant No. 1—designed to produce, 2,600 c.y. per hour of "B" Pervious material.

Plant No. 2—designed to produce 1,350 c.y. per hour of "A" Impervious material.

BOTH PLANTS NOW COMPLETELY DISMANTLED

Ask for detailed list of components

BIANCHI, CENTRAL,
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A Joint Venture
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(Tel. TRinity 2-4341)

CLEARING HOUSE SECTION

FOR SALE

20-Barco Model H-6 Gasoline Dr. Paving Breakers, 100-lb. 1½"x16" chuck. New.

8-Highway Trailer Co. Type PE Earth Diggers, Gasoline Dr. Briggs & Stratton Model 23B Gas Engine with H-T Co. Reduction Unit. With Flex. Shaft, Augers, etc. For truck mounting. Excellent condition.

Construction & Power Machinery, Inc.

270 - 23d St., Brooklyn 15, N. Y.

South 8-4900

SNOW REMOVAL

ROTARY SNOW PLOWS, OSHKOSH 7½ ton 4x4s with Klauer Model TU-3 Rotary Plows—overhauled—ready to work—3 units available.

Also unused parts for R61 Climax Engine.

WALTERS, all wheel drive, **SNO-FIGHTER**, with **FRINK** snow removal blade with blower, unit like new.

Write, wire or call for further information.

WITTENBERG MOTOR CO.

2010-15th Ave. West, Seattle, Wash.

Garfield 1651

BARGAIN

PORTABLE ASPHALT PLANT COMPLETE

Hetherington & Berner PA 30 Plant—4,000 lb. pug mill diesel driven. Fluidometer. Has fifth wheel.

Hetherington & Berner 60" x 30' dryer, diesel driven complete. Hopkins low pressure burners, fuel oil pump. Has fifth wheel.

Cold feeder 60-ton 3-compartment bin with oscillating plate feeders, cold bucket elevator, exhauster, dust collector including liquid precipitator dust eliminator.

Cleaver Brooks boiler.

1—10,000 gal. insulated asphalt tank complete with steam jacketed piping with asphalt pump.

1—10,000 gal. fuel storage tank.

1—20-ton Winslow platform scale.

A quantity of spare parts.

Very good condition. Located in Northern Indiana.

GEORGE H. HARTONG

340 SHERWOOD COURT
LA GRANGE PARK, ILL.

**USED EQUIPMENT
FOR SALE**

Model E, Quickway Dragline and Backhoe Combination mounted on Mack Truck 6,500.00

4½ Cu. Yd. Rex Moto-Mixer mounted on Model WC-28 White Tandem Truck, excellent condition 8,500.00

200 HP Hercules Diesel Engine with clutch-power-take off, like new 3,500.00

**HAWKINS EQUIPMENT
COMPANY**

1475 Thomas Street Box 4695
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P&H Crane

MODEL 255-A

50' boom with tagline winder
(used only for coal rehandling)

13' crawlers.

WRITE, WIRE OR PHONE:
GEORGE HALL CORP.

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St. Lawrence County
Ogdensburg, New York
Telephone — "60"

FOR SALE

- 1 BUCYRUS-ERIE 25 ton late model 22-B tonne crane, 80' boom, 1200x20 rubber, Buda power, Top mechanical condition.
- 1 LORAIN 40 truck crane, 40' boom, 10 wheel Mack carrier, air brakes, Crane Waukesha motor just rebuilt, Machine in sound workable condition and priced to sell.
- 1 LORAIN 77 Standard shovel, 2 yard Amsco dipper. Cat D-13000 power. Machine in excellent condition, recently finished a 200,000 yard job.
- 1 BAY CITY Model 180-T60 truck crane, 100' boom, 30' jib. Both Waukesha motors recently rebuilt completely. Machine's overall condition sound.
- 1 BAY CITY Model 190-T61 truck crane, 100' boom, 30' jib. 12:00x20 rubber, diesel power. Machine condition excellent.
- 1 P&H Model 150 combination shovel and clamshell crane and bucket, with 40' boom. Excellent condition, priced to sell.
- 1 Pole truck, mounted on BF Mack truck, equipped with 2 drum hoist, 38' boom, lifting capacity 5 tons.

R. KENNETH HALL

P.O. Box 88 — Newburgh, N.Y.

We do a Nation-Wide business in
STEEL SHEET PILING

AVAILABLE IMMEDIATE SHIPMENT

4800 pes. 40 to 30 ft. Carn. MP-12 — Kentucky
194 pes. 60 ft. Beth. DP-2 — New York
113 pes. 60 ft. Carn. MP-115 — Illinois
210 pes. 60 ft. Carn. MP-115 — New York
66 pes. 35 ft. Carn. MP-116 — Florida
190 pes. 35 ft. Carn. MP-116 — Iowa
180 pes. 30 to 25 ft. Carn. MP-116 — Missouri
142 pes. 25 ft. Carn. MP-115 — Michigan
250 pes. 20 ft. Carn. MP-112 — Texas

Other lengths and sections new and used at other locations in the United States

**McKiernan-Terry and Vulcan Pile
Hammers and Extractors**
Boilers, Hoists, Derricks, Cranes,
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ASPHALT PLANT

One ton semi-portable Cummer. Complete with dryer, 3 compartment cold bin, 4 compartment hot bin, dust collector, oil fired boiler, piping, storage tanks, main power unit diesel engine, all other paper units electric motors. Now operating under State of Ohio specifications.

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8 Houses, consisting of Full City Block near Downtown
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54-B

Bucyrus Erie Combination, 2½ yard standard Shovel and Dragline. New 1955. Used only 1500 hours.

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1—International TD-24 Diesel Crawler, with hydraulically controlled Isaacson bulldozer angular blade 13' 4", and rear mounted double drum winch, 26" shoes, 7 roller track frame, A-1 operating condition, very little use, new in 1951.

Further information upon request

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Box 566

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1—IHC TD-24 S/N 2819 with Bucyrus-Erie DDP-1 and Isaacson Angle Dozer in excellent condition. Priced \$6,500.00 F.O.B., Fort Worth, Subject to prior sale.

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Huber Model 801 Motor Grader UD-16 Diesel Engine, reconditioned, good tires \$8,500.00
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3' & 4' Symons, 30" Sup. McCully gyratory, 3042 Pioneer primary, Pennsylvania SXC 1358 & SXC 100 hammermills, 12" x 17" Bradford breaker, 3030 New Holland impactor, 42" conveyor, 1300 cfm PRE-2 compressor, Ingersoll Rand QM-2 Quarrymaster drill, 4-tube modern valve packing machine.

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1 - Model 625 PAGE DRAGLINE 180 ft. Boom, 8 yard bucket.

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Cranes, belt conveyors, water pumps, front-end loaders, trucks and aggregate bins.

Satisfactory offer to exceed appraised price.

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Barber-Greene 840 B Plant Continuous mix: 20 to 45 tons per hour

Bros HO-20 Hot Oil Heater

10,000 gallon Storage Tanks

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Littleford DLC 1,000 gallon Distributor mounted on truck

Littleford 108 Broom

Bros R67 Roller

Buffalo Springfield KT 19 A8—8-12 ton Roller

Fairbanks Morse 12237 20 ton Scale

HiWay R Spreader

HiWay AS Spreader

All new in 1955, also:
1956 Bros SP-54 Self-Propelled Roller

Particulars and prices
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DW20 Caterpillar Scraper, S/N 21C649, 1300 hours, 90% rubber, very good condition..... \$22,000

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2 DW-21 Cat Scrapers, S/N BW81 — BW86 with new 337F Turbo charged engine A-1 condition, each 27,000

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Phone Olympic 2-9933
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Model 54 Wood Roadmixer: Serial #135, complete w/Power Take Off and Controls, for D8 Tractor. Excellent condition... \$7,000.00

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Model 79 Lorain Backhoe Attachment, \$3,000.00

55' Northwest 6 Boom w/fairleads, tagline and Gantry \$2,000.00

Hystaway Dragline for D8, D7..... \$3,000.00

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Tractors - Rubber Tired Earthmovers -
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Le Tourneau Equipment**

2-Super C Tournapulls with 15 cu. yd. Scrapers.

2-Tourndozers.

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Equipment in good working condition.
Over \$100,000.00 inventory of spare parts.
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4 Rex 4½ cu. yd. Adjusta-Wate Moto-Mixers

Excellent Condition - Illinois Area

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21.00 x 24 Front Tires. 18.00 x 24 Rear Tires. Hydraulic Power Steering. Non-spin differential. Good Condition.

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S/N 90792, 1951. Good Condition.

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HD-10W TRACTOR**

S/N 9850 w/Gar Wood PCU and Baker Hydraulic Angledozer. Good Condition.
PRICE - \$4,500.00 f.o.b. our yard

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1-Caterpillar D-6 Dozer

Excellent condition
Priced to sell

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Excellent condition
Low hours
Priced right

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3 yrs. old
Priced right.

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Power steering
Diesel engine
Cab, lights & scarifier
Very good condition
Low Price

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CRANE-DRAGLINE
80' Boom - 2½ C.Y. Bucket

\$37,500

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Trailers 31 ft. 3 in. long 8 ft. wide. 1220

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4—Cat DW10 Tractors and Model 10 Caterpillar Scrapers.
 2—D8 Cat Tractors with Angle Blades.
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 1—Model HD20 Allis-Chalmers Tractor and Gar Wood Angle Blade.
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 1—Air Compressor, Gardner Denver, 210 ft.
 1—Air Compressor, Worthington, 105 ft.
 1—LeTourneau Ripper, heavy duty, 3 tooth.

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Master Tandem Crushing Plant

This plant is in top condition and it is complete with Caterpillar D-17000 Power. Has done one small job since a complete overhaul. Serial No. 4281. Available for immediate delivery. Dealers inquiries solicited.

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Bx. 908

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- 1 - #955 Caterpillar Loader - 12A Series.
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- 2 - #60 Caterpillar Scrapers.
- 1 - 300 Amp Wilson Welder mounted on 1947 Chevrolet Truck.
- 1 - 1956 F-6 Ford Truck with a Flat Bed Dump.
- 1 - 1956 F-6 Ford Dump Truck.
- 1 - 1953 GMC Pick-up with half ton Utility Bed.
- 2 - 1956 F-1 Ford Pick-ups.
- 1 - 1956 GMC 650 Tractor.
- 1 - 1956 Dorsey Lowboy Trailer.
- 1 - 1945 Fruehauf 28 Foot Tool Trailer.
- 1 - Athey Belt Loader.
- 1 - Caterpillar #18 Ripper.

Miscellaneous Jack Hammers, Light Plant, Chain Saw, Concrete Mixer, etc.

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Gyratory Re-Crusher in A-1 working condition for sale quick

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 Cat D8 w/Angle Dozer, 2U Series.
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 Five - 50 TD Euclid Rear Dumps.
 Five W Bucyrus Walker W/Cat Engine.
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 Shovel Front Byers 63, new excellent buy.

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Hazleton, Penna.
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Christian 2D Hoist & Swinger, 138 HP Buda Diesel Engine, 15,000# SLP.
 2 100 HP Lucy Portable Hoists, Fire-Box Boilers, 200 lbs, Oil Fired, ASME,
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 30 Ton Steel Stiffleg Derrick, 15' bm.
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 1½ yd. Bucyrus-Erie 38-B Diesel Crane 1948.
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 75KW Cat. Diesel Generator 3/60/440.

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NORTHWEST MODEL 6 \$20,000

Model Q Tournapull \$1,200

1/2 yard to 1 1/2 yard Clamshell and Drag Line Buckets. Never been used.

4—D8 Tractors with Dozers 8R Series \$6,000 Each.

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40% Discount

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3/4 yd. American Crane, equipped with independent boomhoist, 45 ft. boom, fairlead for dragline, long wide tracks, extra counterweight. Age: 17 months. Price \$9000. Pump, Jaeger 4" double diaphragm on 2-wheel rubber tired trailer. Price: \$350. Trailer, 24 ft. flat with high rack sides. Price: \$200. Pump, centrifugal 3", electric drive. Electric motors, 3/4 HP, several. Wood blocks, steel blocks, gate and solid, various sizes, cheap. Cotter Pins, large quantity, various sizes, in original boxes.

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Pavement breaker with Worthington 210 Compressor, mounted on 2-ton GMC truck. Excellent condition. Breaks 800-1000 sq. yds. of 6" concrete a day. Only \$3,700.00. Cat D6 wide-gauge, 9U3670, with Cat 6S tilt blade and 24 cable control power unit. \$4,700.00.

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Two Oshkosh Dump Trucks, four wheel drive. 1952 Model WA 703, eight ton, four yard bodies, standard trucks, closed cabs. Air brakes. These trucks were used by: U.S. Atomic Energy Comm., Government surplus.

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30-45 Ton Capacity HOT MIX Multiple Aggregate ASPHALT Central Plant EXCELLENT CONDITION: Has mixed not more than 35,000 tons.

All Electric Power

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839-840 Central Plant Complete including:
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Dual B-G, Cyclone Dust Collector.

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816 B-G, 3 compartment cold-feed with reciprocating Feeders & Belts.

All Hot & Cold Bucket elevators with connecting drive.

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Small Roller, U.S. Air Force Type Goose Neck Flat Trailer. 30 ft. 75KWDC M.G. set

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Cranes and Shovels

Insley "K-12" 1/2 yd. Trench Hoes or Draglines.
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reconditioned.
Unit "514" 1/2 yd. Trench Hoe, fair condition
Link-Belt Shovel Attachment complete, for
LS-85

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Caterpillar "D-6" Diesel Tractor, Traxcavator Loader, Cab, 1950 Model—excellent.
Caterpillar "D-6" Diesel Tractor w/Traxcavator. Needs some track repairs.
Pettibone "15" 1 1/2 yd. Four-Wheel Drive Tractor Shovel.
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Diamond Portable 15x36 Jaws
20x24 Rolls — One Unit — Approx. 25 Tons
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Also Several Smaller Plants

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ARMY SURPLUS BARGAIN

1—D7 Ser. #3T-17348 Cat. 24 Angle dozer, Army Surplus. Used 1,000 hrs.	\$9,500.
1—Link-Belt LS-85 3/4 yard, used 500 hours, Cat. 8800 Diesel. \$11,000.00	
1—Bay City 180T50 Truck Crane, 80 ft. Boom, 30 ft. Jib. \$17,000.00	
1—Lorain MC-4 Motor Crane, No. 13887, 30 ft. Boom \$13,000.00	
1—1953 Jaeger—600 CFM portable Compressor, Diesel, on rubber, used 2000 hours \$6,500.00	

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Superior 1-1666

FOR SALE or RENT

1—50 ton Full Revolving Electric Gantry Crane, 80% new, 440/60/3, available immediately.
1—60 ton Full Revolving Steam Crane for barge or gantry mounting.
1—955-A P&H Diesel Crane, with Fairlead, only 400 hours.
1—25 ton Steel Stiff Leg Derrick, 80' boom, with 3-drum Electric Hoist and Swinger.
50—Steel Pontoon Float Bridges, 5' x 5' x 7'.
1—No. 1 Vulcan Pile Hammer, reconditioned.
1—No. 5-S McKiernan-Terry Single Acting Pile Hammer, excellent condition.
4—5 1/2 yd. Rex Truck Mixers on 10-wheel Macks.
2—25-ton P&H Truck Cranes.

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178 Tons Carnegie MZ-127—30' to 37'
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All Sections Bought, Sold, Rented

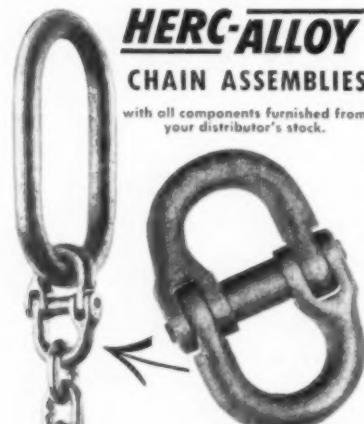
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For Sale	
HYDRAULIC CYLINDERS	
Heavy Duty	
316—3 1/4" x 10"	\$15.00 ea.
178—5" x 12"	\$18.00 ea.
186—4 1/2" x 11 5/8"	\$18.00 ea.
45—4 1/2" x 9 1/4"	\$17.00 ea.
81—2 1/2" x 20 1/4"	\$18.00 ea.
21—1 3/4" x 14"	\$11.00 ea.
49—6" x 10"	\$20.00 ea.
75—2 3/4" x 15 1/4"	\$15.00 ea.
Cylinders are used but in good condition. Prices quoted are about 1/4 the price of new ones. Check w/order, deduct 5% discount.	
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HERC-ALLOY CHAIN ASSEMBLIES

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CM Hammerlok® COUPLING LINK

- NO PEENING
- NO WELDING

- Hammerlok is made of alloy steel... is stronger than Herc-Alloy chain... is thoroughly field tested.
- Write for literature or ask your industrial distributor about Hammerlok.
- Made by the makers of Herc-Alloy... the original alloy steel chain.

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CM HOISTS AND CHAIN

... for more details circle 203, page 16

Manufacturers' Literature

Dust Collector for Drilling

A new device for easy, inexpensive dust collection in overhead drilling operations is described in Bulletin Number 1504-3 published by Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh, Pa. The M-S-A drildust bucket is designed to provide a portable method of dust collection for overhead rotary drilling operations where fluted augers are used. Basically, it consists of a rubber hood and a collecting bucket with a support assembly, all of which slide over the drill.

For more information circle 136 on Service Coupon Page 16 and mail now.

Torque Converters

Heavy-duty, single-stage hydraulic torque converters for transmission of 100 to 1000 hp to excavating, earth-handling, and construction machinery are described in Bulletin No. 468 issued by The National Supply Co., Two Gateway Center, Pittsburgh, Pa. The bulletin gives features and specifications of 17 sizes and capacities of National torque converters for exact matching with engines in this power range.

For more information circle 137 on Service Coupon Page 16 and mail now.

Air Hose Data

A new 2-page bulletin on its line of air hose has been published by the B. F. Goodrich Industrial Products Co., Akron, O. The bulletin brings data on BFG air hose up-to-date, especially on Maxecon all purpose hose, now made in a complete size range for use as an air, water and gasoline hose. Besides Maxecon, hose reviewed includes: Highflex, recommended for bench work and small shop tools; Type 50, recommended for tie tamping, compressor service, ore mining, quarry service and other general uses; Commander, recommended for rugged uses in mines and quarries; Type 88, an air, manifold and jetting hose recommended for heavy duty service in mines and quarries where tools are oiled through the hose and abrasion on cover is severe.

For more information circle 138 on Service Coupon Page 16 and mail now.

One-Use Drill Bits

A comprehensive description of Le Roi-Cleveland one-use drill bits, their construction, specifications, and the preparation of drill rod shanks is given in a recently issued 6-page bulletin, (RD29) published by the Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis.

For more information circle 139 on Service Coupon Page 16 and mail now.

How Unusual Surveying Problems Were Solved

"Tips from the Surveyor's Notebook"—a new collection of short articles on unusual surveying problems and their solutions—has been published by W. & L. E. Gurley, Troy, N. Y. The 20-page "Notebook" contains the articles, case histories and field tips which have created most comment and have proved most helpful to engineers and surveyors during the six years the "Notebook" has been published.

For more information circle 140 on Service Coupon Page 16 and mail now.

Drott Skid-Shovel

International Harvester Co. has just published a 4-page, 2-color folder on the new 2½ cu. yd International Drott TD-14 4-in-1 skid-shovel. Job-site photos illustrate the extreme adaptability of the unit, in its quick-change from skid-shovel to clamshell to bulldozer. Request Booklet CR-521-F, Construction Equipment Division, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

For more information circle 141 on Service Coupon Page 16 and mail now.

Hardsurfacing Extends Equipment Life

Effectiveness of hardsurfacing in extending the life of equipment continually subjected to wear and impact in aggregate and cement plants is told in a brochure (Form 1500) published by Rankin Manufacturing Co., 616 South Marengo Ave., Alhambra, Calif., makers of Ranite hardsurfacing welding materials. The brochure presents case studies of hardsurfacing uses and contains photographs of actual applications. Examples shown include a gyratory crusher mantle, crusher rollers, mill hammers, screw flights and others.

For more information circle 142 on Service Coupon Page 16 and mail now.

Hydraulic Backhoe

A new 6-page, 3-color bulletin, TTS-121, published by American Tractor Corp., Churubusco (Ft. Wayne), Ind., illustrates special features of new Terra-Trac hydraulic backhoe, with detailed operational drawings, and complete specifications for both backhoe and TerraTrac crawler tractors on which it can be mounted.

For more information circle 143 on Service Coupon Page 16 and mail now.

Rock Drills

A new 12-page bulletin describing Le Roi-Cleveland rock drills has been issued by the Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis. The 3-color bulletin, AT111B, uses numerous halftones and line drawings to illustrate the company's line of construction tools—breakers, sinkers, clay spades, tampers, and wagon drills. Individual pages are devoted to tool design and construction, operator handling and care, and mainte-

nance features leading to longer tool life. The lubrication system, drill and blow actions, and valve and piston design receive special attention.

For more information circle 144 on Service Coupon Page 16 and mail now.

Calcium Chloride Use in Winter Maintenance

A publication, Brief No. 1B-1, available from Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C., explains how to mix calcium chloride with abrasives and its direct application on icy highways and streets.

For more information circle 145 on Service Coupon Page 16 and mail now.

Bituminous Mixing Plant

A new 12-page bulletin (AP-23) describing the new Cedarapids Model H15 bituminous mixing plant, issued by Iowa Manufacturing Co., Cedar Rapids, Ia., gives complete specifications and engineering details of the batch-type plant, including full information about each sectionalized unit and component of the stack-up, tower-type design. Also included are flow diagrams, a description of the simplified controls, an explanation of the easy erection features, and recommendations for auxiliary equipment to be used with the H15 plant.

For more information circle 146 on Service Coupon Page 16 and mail now.

New Engines for Old Machines

"New Life For Old Machines" is a new informative booklet (Form DE835) issued by Caterpillar Tractor Co., Peoria, Ill. The theme of this booklet deals with machines powered by engines such as cranes, crushers and cotton gins. It is suggested that the customer or owner should periodically examine his operating cost in downtime and repairs. Perhaps, the brochure points out, his present machine is not as productive as it should be or was previously. Several actual job installations are discussed using dollar and cents values. Repowering in many cases gives the customer the added advantage of increased equipment availability.

For more information circle 147 on Service Coupon Page 16 and mail now.

How to Operate Motor Graders

To help new motor grader operators, and as review for experienced operators, Caterpillar Tractor Co., Peoria, Ill., has published "Basic Blading," a 32-page manual (Form DE628) with illustrations on the use of the controls, basic blade positions and their applications, and the control positions to accomplish many of the jobs a motor grader does.

For more information circle 148 on Service Coupon Page 16 and mail now.

Off-Highway Trucks

A folder on its two new off-highway trucks has been issued by International Harvester Co. The 6-page, 2-color folder completely describes the 24-ton model 95 and the 18-ton model 65 Payhaulers. Close-up photographs and drawings illustrate the rugged and well-designed components of the units. Ask for: Booklet CR-495-F, Construction Equipment Division, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

For more information circle 149 on Service Coupon Page 16 and mail now.

For Quality Concrete Pipe Forms...

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Backed by over 45 years' of reliable service, the QUINN Heavy Duty form is recognized as the STANDARD design and the finest concrete pipe form everywhere. Used in making pipe by vibration, spading or tamping. Sizes for pipe from 10" to 120" and larger. Lengths and gauges (as required) or bell sizes made in any lengths desired. If your pipe orders specify extra large sizes, odd shapes or unusual lengths there's a Quinn form made to produce the finest pipe at lowest possible cost.

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... for more details circle 239, page 16

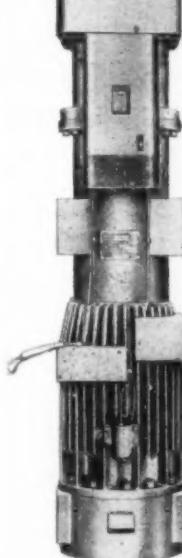
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... for more details circle 254, page 16

With the Manufacturers and Distributors

MCGLONE ELECTED VICE-PRESIDENT. John J. McGlone was elected vice-president of the Williams Bucket Division of The Wellman Engineering Co., Cleveland, Ohio. Mr. McGlone, who is also general manager of the Williams Bucket Division, joined Wellman in March, 1955.

MCKINNEY JOINS HYSTER. Sam D. Mc-

Kinney, formerly with the Portland Oregonian, Hollis Goodrich & Associates, and a former staff member of the Lumbermen's Industrial Relations Committee, has joined the Sales Promotion Department of Hyster Co., Portland, Ore.

MCCOY GOES TO WEST COAST FOR CATERPILLAR. William E. McCoy, heretofore eastern sales manager for Caterpillar Tractor Co., Peoria, Ill., has been appointed sales manager of Caterpillar's southwest division with headquarters in San Francisco. He succeeds Bernard L. Hagglund who died May 12.

SWALLEY JOINS F. D. CUMMER & SON. William C. Swalley, 25-year veteran vice-president and former general sales manager of Wellman Engineering Co. has resigned to become president of F. D. Cummer & Son Co., Cleveland, Ohio. R. N. Birdsall, Cummer's general manager and chief engineer, has been elevated to the additional post of vice-president.

WETZEL NEW MANAGER ATLAS EASTERN OFFICE. James L. Wetzel has been appointed manager of Eastern District explosives sales office of Atlas Powder Co., Wilmington, Del. His headquarters will be in the company's general offices in Wilmington. Mr. Wetzel, manager of Atlas' explosives sales office in Pittsburgh, Pa., since 1951, is succeeded in that post by John K. O'Hare, special representative in the office.

AUSTIN-WESTERN PROMOTIONS. J. Arthur Fitzens has been appointed manager

in charge of domestic sales of the products of Austin-Western Works, Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Aurora, Ill. A. Merrill Smith has been appointed assistant sales manager. Mr. Fitzens has served Austin-Western for 22 years in various capacities, including those of central district manager and assistant sales manager. Mr. Smith has had many years of experience in the construction equipment field, and was formerly district manager for Austin-Western in Texas and the Southeast.

NEW DISTRICT SALES MANAGERS FOR FWD. Three new district sales managers, Robert M. Ashley, Glen Pate, and Robert J. Peterson, have been appointed by the Four Wheel Drive Auto Co., Clintonville, Wis. Ashley, headquartered at Denver, Colo., will supervise dealer sales of FWD's custom-engineered four and six-wheel-drive heavy-duty trucks in Montana, Utah, Colorado, New Mexico, and Wyoming. Pate, whose headquarters are at FWD's Dallas branch, 1215 Dragon St., is district sales manager for North Texas, Oklahoma, Kansas, and Western Missouri. Peterson will handle the FWD sales territory of Washington, Oregon, Idaho, Alaska, and British Columbia, with headquarters at the Feeney Machinery Company, FWD dealer at 1028 Sixth Ave. South, Seattle, Wash.

THOR MOVES MILWAUKEE OFFICE. The Milwaukee branch office of Thor Power Tool Co., Aurora, Ill., has been moved to 3911 Greenfield Ave., Milwaukee, Wis.



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and Children's Playground

Write for Brochure and Rates.

the Fountainhead MOTEL

Directly on the Ocean at 160th St.

Bituminous Concrete

(Continued from page 135)

shut down and the paddles replaced, because you will have a gap there whereby the material cannot be picked up.

Something else we have found is that if you take the end paddles and reverse them, you can get a boxing action.

Do not overload the mixer more than 15% and do not underload it more than 20% above the rated capacity of the mixer. The tips of the paddles at the peak of the turn should be about 2 or 3-in. outside of the mix material, and if you overload them, they will not be—and you will not get good mixing. If you underload the mixer, the material will lay around the shaft and good mixing will not result.

The material is then dropped down into the truck and is ready for delivery to the paver. All trucks should be covered so as to maintain an uniform temperature, said temperature should be within 15 degrees plus or minus that set up by the engineer.

• *Plant Testing Laboratory.* In talking about controls in plants, such as we have done here, I think each producer should have a small, well-equipped laboratory to run samples of material so that the design may be checked at least twice daily.

Here we have three different types of extractor: The Rotarex, which requires approximately $\frac{1}{2}$ hour to run; the Immerex, requiring $\frac{1}{4}$ hour to run; and, the Maryland extractor, which takes a larger sample, approximately 8 to 10 lb., but requires 3 hours to run.

Any hot asphaltic concrete plant that is controlled in the manner we have just discussed cannot help but produce a high type asphaltic concrete.

You'll get more SUNSHINE!
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Are you still active in the field? Have you moved or changed your position?

Unless you send this information directly to us we can't be sure. Sometimes a reader's name is cut from the mailing list because we are not sure that our information as to name, title and address is right. Your name might be cut from the mailing list.

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Even if you think we know all about you, please fill in the information requested below and send to us by return mail. Our auditors require proof of accuracy of our mailing list. You are the only person who can help us on this. Do it now before you forget, so you can be sure your magazine will always be properly addressed to you. New names cannot be added or old names retained on our list unless we have all this information. Please print or type.

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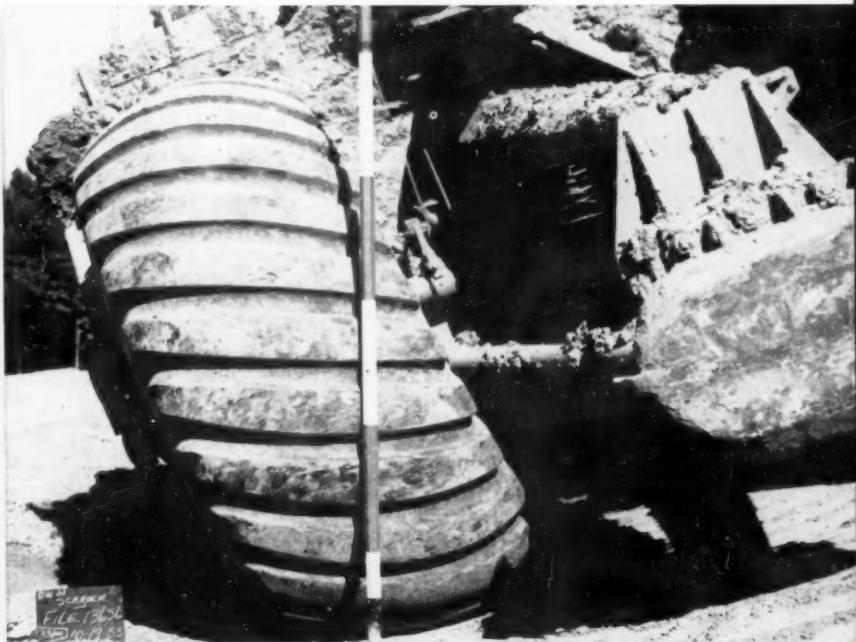
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Caterpillar "torture tests" prove advantages of earthmover tubeless tires

Developed through the close co-operation of Caterpillar with leading tire manufacturers, these heavy-duty tires are now standard on all models of Caterpillar wheel-type Tractors, Scrapers and Motor Graders.



Punishing tests of heavy loads and high speeds at the Caterpillar Proving Grounds on Cat DW21 Tractors and Scrapers prove that new tubeless tires set new endurance records for earthmoving—pay off in longer life and less down time. Large photo at top shows test of bead air sealing ability with heavy, sidehill loads.

The search for a better way never stops at Caterpillar. The result—a constant flow of improvements in earthmoving equipment that pays off in increased production and lower costs on your job.

These new tubeless tires are an example of Caterpillar's policy of leadership in action.

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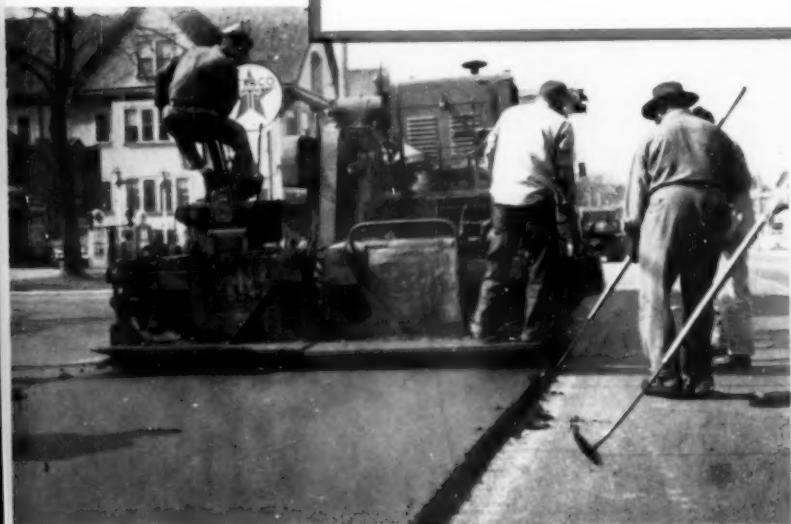
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